

# A SELF-SUFFICIENT NEIGHBOURHOOD IN GOES



**UNIVERSITY**  
OF APPLIED SCIENCES



**marsaki**



# RESEARCH TO THE DEVELOPMENT OF A SELF-SUFFICIENT NEIGHBOURHOOD IN GOES-OOST

A thesis submitted for the degree of bachelor of science



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*'And no challenge -- no challenge -- poses a greater threat to future generations than climate change.'*

- Barack Obama



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I can look back on a graduation internship at Marsaki in Goes with great pleasure.

*Pedro Mol*

*Goes, June 2017*

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## Abstract

The Netherlands is well-known for its urban density and extensive knowledge of climate adaptation measures. Old neighbourhoods are being restructured and Marsaki is one of the leading firms that develops sustainable solutions. A specific neighbourhood in Goes-Oost, called the Verzetsheldenbuurt, is going to be restructured due to outdated housing and infrastructure. In addition to the normal procedure, Marsaki would like to explore the possibilities of the neighbourhood becoming as ecologically sustainable as possible. To examine these possibilities a holistic and integrated approach has been used and the main question for this study is therefore: *What are the possibilities to make the neighbourhood in Goes-Oost self-sufficient by looking at the spatial, environmental, climate, social and financial aspects?* This is supported by six sub questions that derive directly from the main question.

Data for this study were collected with the help of desk research, where the terms self-sufficiency and eco-neighbourhood were defined. As a second research method, three eco-neighbourhood case studies were thoroughly analysed: The existing neighbourhoods *Eva-Lanxmeer* in Culemborg and *Hof van Heden* in Hoogvliet, and a future neighbourhood: the *Olmentuin* in Steenbergen. Research to case studies was enforced by doing interviews with relevant stakeholders. These methods revealed the most important themes to create an eco-neighbourhood: water, energy, urbanism, environment, participation, process and finance. The final method is defined as applied research: a pilot project was used to answer the main question. To successfully analyse the project area, an area-analysis has been conducted that includes a layer-analysis, stakeholder analysis and SWOT-analysis.

An eco-neighbourhood catalogue was developed as result from the defined methods including the most important options per defined theme. The results show that complete self-sufficiency is not suitable and the goal is to become as ecologically, sustainable as possible. The themes all have specific building blocks and together form an integrated process.

The project area, called the Verzetsheldenbuurt, distinguishes itself from being the transition zone between the urban centre of the city of Goes, and the rural area at the border of the city. The area identifies itself as the centre for education (primary and secondary schools for various religions and levels) and health care. To maintain the spatial qualities of the neighbourhood, these qualities have been included in the vision. This study has proven that complete self-sufficiency requires a wide project area and extensive social interest and most likely diminishes comfort of inhabitants in an urban area. Although, a high range of advantages rise when this type of neighbourhood is developed. Subsidies form the top-down advantages that can be acquired on both the neighbourhood and inhabitant scale. By integrating high social cohesion and participation, additional costs can be avoided by cooperating in the neighbourhood collectively. A foundation can be set up to manage the maintenance and cooperation within the Verzetsheldenbuurt. The goal is to develop a neighbourhood that breaths air and quality to the living environment while also breathing the atmosphere of an urban neighbourhood. Sustainable living in the Verzetsheldenbuurt is the key principle, enjoying the vivid city centre or surrounding natural areas while having cultural, social and medical facilities at your disposal. The vision for the Verzetsheldenbuurt has been visualised by three different spatial concepts, that all use the same tools as defined in the vision. To select the best option, all criteria were applied to the spatial concepts and should stay as economic feasible and realistic as possible. Scenario 3 has proven itself to be the most suitable option, where the best combination of social cohesion, realism and self-sufficiency is achieved.

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## List of abbreviations

<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>EVA</b>	Ecologisch Centrum Voor Educatie
<b>CBS</b>	Centraal Bureau voor de Statistiek
<b>IPCC</b>	International Panel for Climate Change
<b>UN</b>	United Nations
<b>CSR</b>	Corporate Social Responsibility
<b>EPC</b>	Energie Prestatie Coëfficiënt
<b>BENG</b>	Bijna Energie Neutraal Gebouw
<b>ECO</b>	Ecological
<b>TBL</b>	Triple Bottom Line
<b>BAG</b>	De Basisregistraties Adressen en Gebouwen
<b>SWOT</b>	Strengths, Weaknesses, Opportunities & Threats
<b>RWS</b>	Regionale Woningbouwvereniging Samenwerking
<b>BEL</b>	Bewonersvereniging EVA-Lanxmeer
<b>NHW</b>	Netto huidige waarde
<b>NCW</b>	Netto contante waarde
<b>BTW</b>	Belasting toegevoegde waarde
<b>EPV</b>	Energieprestatie vergoeding

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# 1. Introduction

## 1.1 Background information

*'And no challenge -- no challenge -- poses a greater threat to future generations than climate change.'* (Obama, 2015)

This powerful quote encompasses the worldwide urge of the changing climate and all the devastating impacts it will bring. With a growing population and an emerging middle class, together with the changing climate, the world is calling for smarter and more resilient solutions. Furthermore, the growing population increases the urbanization rate. This calls for proper use of free urban space that considers the great threat of the changing climate. 66% of our environmental impact is directly related to home activities, consumption of energy and food ingestion. 33% of our income is spent paying for household consumption – rent, energy, heating and food. In the future, these numbers will be very different (EFFEKT, 2016).

The Netherlands is one of the leading countries in adopting climate adaptation measures. The whole world takes the Netherlands as leading example to create a sustainable future. Of course, this is the result of the world-wide rise in relevance of climate change and the Dutch history of battling the water and its climate. Energy has a high role in municipalities, where 'climate-neutral', 'CO2-neutral' or 'energy-neutral' neighbourhoods, communities or municipalities are often set as goals. Apart from that, the Dutch government wants to realise a CO2 reduction of 30% by 2020, raising the contribution of sustainable energy sources with 14% by 2020 and the application of BENG (almost building energy neutral) from 2020 to become one of the most sustainable and efficient energy users in Europe by 2020 (Rijksdienst voor Ondernemend Nederland, 2012).

Sustainability and sustainable developments have been rising since the 70's and still are rising entities. Since this decade, the concerns of the rising population rate, modern technology and social attention to new global environmental problems such as global warming, pollution and deforestation started to rise (Sustainable development commission, 2011).

The Netherlands is well-known for its urban density and therefore a lot of old neighbourhoods are being restructured to meet modern standards. New neighbourhoods are trying to be innovative and these developments have a lot of opportunities. The future is going to be sustainable and everyone wants to play a role in it. There are different ways to create a sustainable neighbourhood: it should be climate neutral and should fit in the changing climate. There are possibilities to make it self-sufficient and the houses should be sustainable and exchange energy where possible. The trend of building sustainably is one that has been executed in the Netherlands a few times already. There are comparable projects available in the Netherlands, which have been developed already or all still in the developing phase. Think of the neighbourhood in Almere (EFFEKT, 2016) and the neighbourhood in Culemborg (stichting E.V.A., 2012). The trend of building self-sufficient and sustainable is one that can be implemented with a diverse range of variabilities and is therefore a relevant subject now.

Restructuring is also happening in Zeeland, a province in the south-western part of the Netherlands. Many neighbourhoods are going to be changed. One of these restructuring neighbourhoods is in Goes, a vivid city with around 25000 inhabitants (CBS, Inwoners Goes, 2016). Goes, located in Zeeland, is part of the South-Western Dutch delta, and is therefore prone to the problems of climate change and is one of the first cities to deal with these issues in the future. That is why a great opportunity lies within this neighbourhood to tackle some of the climate change issues. Contact started with a firm called Marsaki, who were willing to invest in this area and help it giving a new direction.

Marsaki is one of the leading real estate and consultancy firms located in the province of Zeeland, which focuses on developing, managing and restructuring various housing projects. The firm has a lot of knowledge in building sustainable and perceives it as an essential feature of building in the future. They perceive sustainable building as the main aspect of energy saving. However, it also includes the sustainable use of building materials, having a healthy indoor environment and creating pleasant and liveable houses, buildings, neighbourhoods and cities. Marsaki has noticed the increasing relevance of the changing climate and recognises the immediate need of adapting to the climate in their building sites and takes good action in doing so. In February 2017, they published a report about a new policy on house building. This report shows that all projects, starting from 2020, should be built following the BENG principles (LenteAkkoord, 2017). BENG stands for almost building energy neutral and includes three criteria such as energy supply, sustainable use of fossil fuels and using renewable energy sources (LenteAkkoord, 2017). The report states that all buildings should suffice to the demand of BENG by 2020 and is of great relevance to both the research and Marsaki. Moreover, Marsaki is continuously looking for new solutions and possibilities to create sustainable areas. In this research, Marsaki proves itself to be looking for sustainable solutions such as the creation of an eco-neighbourhood in Goes-Oost. One of the restructuring neighbourhoods within Marsaki has a lot of opportunities and these should be taken to answer Obama's call of tackling the climate impacts.

## 1.2 Problem statement

The restructuring neighbourhood in Goes-Oost primarily accompanies social housing now, which is one sided, but was at that time a good decision. These cheap social houses are old and outdated. There are many structural problems present in the houses such as leakages. Furthermore, the inhabitants also think that restructuring is the best solution in the neighbourhood. The houses have had an exploitation time of 67 years and have reached the end of their technical and economical function. The infrastructure is outdated and one-sided, lacking public green and parking lots. While looking at the developments in the future, these important issues present in the neighbourhood need to be tackled. The municipality and housing corporation have agreed that restructuring will improve the image of Goes-Oost. It is a neighbourhood with a lot of opportunities and has a good research perspective. Also, this neighbourhood needs to adapt to the changing climate and possibilities must be researched to whether this neighbourhood could become self-sufficient.

The main research question is defined as followed;

**What are the possibilities to make the neighbourhood in Goes-Oost self-sufficient by looking at the spatial, environmental, climate, social and financial aspects?**

To get to the answer of the main question, six sub-questions are defined;

1. **How is self-sufficiency of an eco-neighbourhood defined when looking at the context of the research?**
2. **What are the most important themes to make an eco-neighbourhood and what are the most successful options based on previously implemented projects?**
3. **What are the possibilities to become self-sufficient concerning the environment and the climate?**
4. **How can participation and social cohesion contribute when creating a self-sufficient neighbourhood?**
5. **What are the spatial and urban values of the neighbourhood and how can they be maintained and improved while becoming self-sufficient?**
6. **What are the financial influences in making a self-sufficient neighbourhood?**

To get to the answer of the main question, different methods are going to be used and these will be explained in the methodology chapter.

### 1.3 Objectives

The main objective that is going to be accomplished is the creation of a structured vision for the Verzetsheldenbuurt, accompanied by an outline and spatial design. During the process of reaching this objective, problems and issues are going to be encountered. Together with Marsaki and the HZ University of Applied sciences research will be conducted to improve the chances of creating a successful neighbourhood. In response to the problem definition and the defined main- and sub questions, the most important research objectives are defined. The research should provide enough evidence and examine all the possibilities in solid results, leading to a new spatial concept that includes a well-thought vision. The results will partly be achieved by looking at previously implemented projects and interviews will be included. The results will be built up around the following objectives:

- Self-sufficiency is an important term that should be defined before going deeper into the subject. By looking at the context of the project area, the level of self-sufficiency of an eco-neighbourhood will be defined.
- Finding enough relevant information from the case study research, where their implementations and options will be divided into the defined themes, resulting in a catalogue of most important options and risks.
- Defining the most important opportunities in the project area, by doing an area analysis.
- Creating a vision for the neighbourhood in Goes-Oost, accompanied by spatial concepts.

Furthermore, this study implements the results into the neighbourhood in Goes-Oost. This 'pilot', as it can be formulated, will get three spatial concepts that include the most suitable solution. Before the start of the research, it was important to determine the project boundaries. It is easy to define a subject too broad since this subject encompasses many different facets. The sub-questions are part of the boundaries and that is why this research focuses mainly on the most important Delta Management's competences. The competences are written down and integrated in the sub-questions. When creating a new vision, law & policies have been excluded due to time limitations. The research further limits itself by looking at a certain area, which will be explained in the theoretical framework.

### 1.4 Outline

This thesis report consists of six main chapters, including paragraphs and sub paragraphs. The first chapter was the main introduction to the subject and will lead to a thorough theoretical analysis in chapter two. This chapter provides an overview of the most important theoretical background of the research subject and the conclusion of the analyses of the project area. The third chapter will explain what methods have been used to get to the results, elaborated in chapter four. The results chapter will provide the conclusion of all the analyses and the vision for the project area, which will be the foundation of the main question's answer. The fifth chapter will include limitations in the discussion and the sixth chapter will be the thesis' conclusions and recommendations followed by the bibliography and appendices. The blue text areas throughout the report serve as summaries and conclusions of the chapters and answer the sub questions.





## 2. Theoretical framework

The theoretical framework consists of a conceptual model and desk research that will search for scientific explanations of specific notions. The theoretical framework will explain how scientific research defines specific themes that are important for the graduation research. Furthermore, the most important concepts are elaborated and the research' relevance is explained.

### 2.1 Conceptual framework

A clear process is necessary to encompass all the aspects in this research. To get a good outline of the research's process, a conceptual framework has been composed that shows two paths that eventually lead to one result (figure 2.1). The case study research has its own path and will result in the creation of an eco-neighbourhood catalogue. Together with the other path, which includes the normal features of an area-analysis, the most important opportunities can be analysed. These two variables, 'eco-neighbourhood catalogue' and 'opportunities Goes-Oost' will result in the creation of a vision for the pilot project and will form the answer to the main research question.

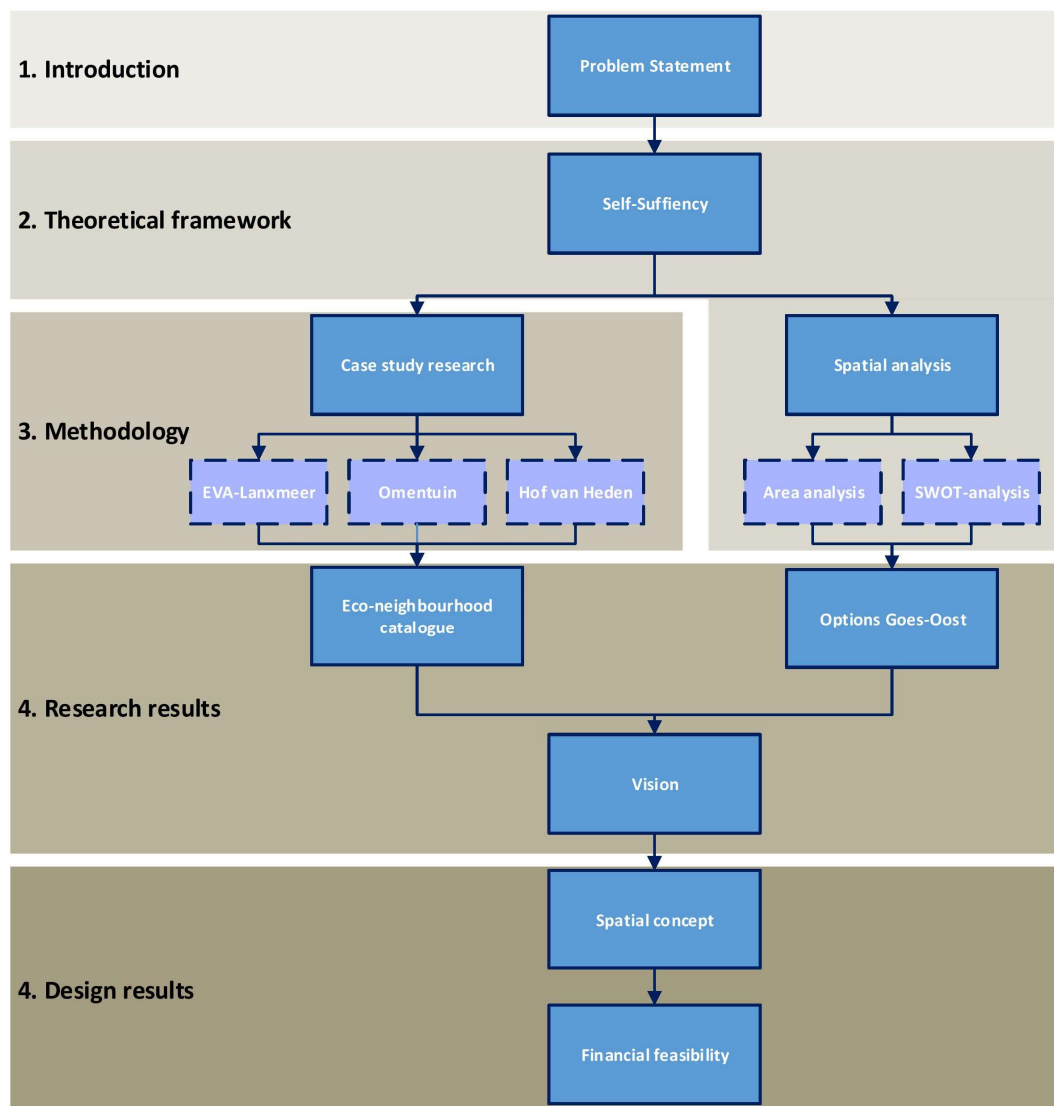


Figure 2.1 Conceptual framework (Author, 2017)



## 2.2 A paradigm shift: towards sustainable development

According to the new IPCC report the climate is changing rapidly and the need for change is significant (IPCC, 2014). There are various sources that state a shift is occurring from the technocentric and industrial paradigm, to a more sustainable paradigm. Gladwin et al. (1995) stated that there are various shifting paradigms in sustainable development with a rising need for sustainable communities and neighbourhoods. Four leading criteria are: climate change, urbanization, economic growth and globalization (Thomas N. Gladwin, 1995) (Smith, 2006). Before delving deeper into the shifting paradigm, it is important to know how sustainable development is defined. Humanity are living beyond their needs when looking at the fossil fuel use and therefore a trend rises of sustainable building in both rural and urban areas (Dodge, Data & Analytics, 2016). Future generations will be damaged if no change is undertaken. Large scale initiatives mostly include changes on the national level while change in local developments should come from local initiatives.

Sustainable development is a widely-used term and it is important to critically define as to what this research assumes to be sustainable development. The definition has been defined a long time ago in the UN Document: Our Common Future from the commission of Brundtland in 1987.

*"Sustainable development is a type of development that meets the needs of the present, without compromising the ability of future generations to meet their own needs."*  
(Brundtland, 1987)

What is sustainable development? Several researches have been conducted on the essence and purpose of sustainable development such as Jorge dos Santos et al. (2016). They didn't only look at what sustainable development was, but also at how to measure it consequently with the economic growth. Furthermore, Ivan Bolis et al. (2016) studied in the paper **'Are we making decisions in a sustainable way? A comprehensive literature review about rationalities for sustainable development'** what the most important processes are to do something in a sustainable way since the subject is so broad. They concluded that more education is needed in the decision-making processes for sustainable development (Ivan Bolis, 2016). Looking at the subject critically, sustainable development is often a lie incorporated (Jensen, 2015) in land use plans to claim a company's social responsibility. (CSR) The definition should imply that the world and its natural resources are critical to the life support and pleasure. That is why it is so important that these life-enhancing and life-supporting qualities are not compromised (Barton H. , 2000).

Gladwin et al. (1985) defines the paradigm shift as 'sustaincentrism' versus sustainability with the most important terms including inclusiveness, connectivity, justice, prudence and security (Thomas N. Gladwin, 1995). Recognizing that people's actions toward nature and society and each other are the source of growing damage to the environment. Resources are needed to meet human needs and ensure survival and development. It is important to act to the best of one's ability to help make the earth a secure and hospitable home for present and future generations (Thomas N. Gladwin, 1995). Sustainable development can be applied on a lot of subjects since it has a wide perspective. Sustainability also comes up when looking at building projects and urban plans, as they are of great importance for future generations. The term was used and applied further in this research to define the shift from ordinary neighbourhoods to eco-neighbourhoods (Barton H. , 2000).

## 2.3 Self-sufficiency

The main research question states the term self-sufficiency, which was first defined by Kains (1973):

*"The state of not requiring any aid, support, or interaction for survival; it is a type of personal or collective autonomy." (Kains, 1973)*

Self-sufficiency, also called autarky, (Schmidt et al., 2012) includes that the concept of absolute energy autarky does not allow any balancing, which means that no external energy resources are imported. The term has several variables, such as production and energy, that all operate on a different level and can have various levels of autarky. The study of Schmidt et al. (2012) also states that locally produced energy may have benefits such as reduced transportation distances, increased quality of local environment, maintenance of cultural landscape and the insurance against future uncertainties in energy prices, climate change and fluctuating energy demands (Schmidt et al., 2012) (Muller et al., 2011.). Resulting from literature review, self-sufficiency or autarky reveals itself to not be a new idea. This research mainly focuses on the promotion of local energy systems based on renewable, internal potentials. In previous researches in community sustainability, the implementation of renewable energy technologies, with an emphasis on self-sufficiency, local influence and involvement, has long been emphasized. However, it can be questioned whether complete autarky is a proper solution considering the pilot area and its demographics (Müller et al., 2011).

Self-sufficiency is often used as a tool from the top-down level, being incorporated in laws and policies. This research is looking at opportunities to become self-sufficient by using a combination between the bottom-up level, which means the inclusion of local inhabitants, and a top-down level. The term self-sufficiency is also mostly used as a number in energy supply (EPC, BENG), and does not use a holistic and integrated approach towards sustainability and long-term implementations. In addition, complete self-sufficiency is not always the most suitable solution concerning the quality of life and comfort of inhabitants, which is in the first place the most important demand when building a new neighbourhood or community.

This research is using the term self-sufficiency as followed: becoming as ecologically sustainable as possible, looking at economic, social, financial and ecological approach without damaging the quality of life for inhabitants and thus taking a holistic and integrated approach. Consequently, complete autarky is not an absolute requirement in this thesis and a broader range of options can be analyzed.

## 2.4 Eco-neighbourhoods

Self-sufficiency comes back in the flows of an eco-neighbourhood. It is a form of measuring that can identify its level of sustainability. Before going deeper into eco-neighbourhoods, it is important to identify the definition of a neighbourhood. There is a common definition:

*"A neighbourhood is a geographically localized community within a larger city, town, suburb or rural area. Neighbourhoods are often social communities with considerable face-to-face interaction among members." (Rosenbaum, 2006)*

A neighbourhood often goes together with a community, a combination of governments, shared local history or sense of community feeling. In this research, it is better to talk about a neighbourhood since it compromises a certain area and has clear boundaries, while a community has loose boundaries and has an extended social concept. It is hard to define a neighbourhood's boundaries since different areas have overlap. That is why the boundaries of what the research will call a neighbourhood is defined by infrastructural borders. Criticism on the term 'eco-village'

or 'eco-neighbourhood' rises since it provides a misleading definition. However, the term 'eco-neighbourhood', being an ecologically sustainable neighbourhood, will be used to improve the continuity of the research.

This research has a straightforward definition for an eco-neighbourhood: "A neighbourhood where inhabitants meet their own needs enhancing their well-being without damaging the natural world or endangering the living conditions in the future and being self-sufficient where possible, while using renewable energy." The internationally based Eco-Villages Network stresses a permaculture approach and high local autonomy (Barton H. , 1998). Furthermore, the Freiburg Statement on New Urban Neighbourhoods (1995) stated seven important principles:

- Heterogenous social composition;
- A pedestrian-dominated public realm to facilitate 'good social' life and provide an attractive human-scale environment;
- Diversity of use, for example combining housing and working;
- Active participation
- Architectural identity, which is later defined as the local Genius Loci of an area;
- Discouraging automobile use by encouraging public transport;
- Cutting energy use and pollution, by raising ecologically responsible development principles.

An 'eco-neighbourhood', as it is defined in this research, is not a standalone term that can be included in all sustainability processes. It is a combination of several themes and concepts that work as an integrated and cohesive whole (Barton H. , 1998). Based on desk research and literature review of previous eco-neighbourhood studies, this bachelor thesis identifies an eco-neighbourhood by splitting it up in seven themes and a framework has been created based on these themes as can be seen in figure 2.2 (stichting E.V.A., 2012) (Barton H. , 1998).

The eco-neighbourhood framework (figure 2.2) shows that the themes use the concept people, planet, profit as running threat. While doing research to becoming sustainable and taking part in sustainable development, it is almost impossible to avoid the concept of the 3 P's. In 1994, the term was coined by John Elkington, who called it the Triple Bottom Line (TBL) (Elkington, 2004). The three components the TBL consists of are **people** and their social responsibility, the **planet** and its environmental sustainability and **profit**, the bottom line. Thus, this results in the creation of the 3 p's: People, Planet, Profit. The integration of the 3 p's into a development plan is vital to create good relationships and to create a solid long-term vision. Furthermore, literature review revealed that it is impossible to neglect the process part of a project since this is how all themes become an integrated whole. That is why this research acknowledges the process as an extra and results in People, planet, profit and process. People, planet & profit forms the basis for the eco-neighbourhood themes that have been defined: Participation, urbanism, environment, water, energy, finance and process. An important theme has been excluded from this research: law & policies.

### *Participation*

The importance of participation in the creation of an eco-neighbourhood has been acknowledged but often neglected. Barton (1998) tried to categorize eco-neighbourhoods and found that a sense of community feeling is necessary and community involvement is one of the keys to become successful (Barton H. , 1998). Also, a study from Noorduyn & Wals (2003) showed the importance of participation from the start of the design process to the actual living phase (Wals, 2003). Participation is an important theme running through this research.

Participation as a practice in spatial planning started with the presentation of the 'ladder of participation' by Sherry Arnstein in 1969 (Arnstein, A Ladder Of Citizen Participation, 2007). In this ladder Arnstein presented a typology of citizen participation, with eight rows corresponding to the citizens' power when determining a plan (figure 2.3). Participation could take place on different (increasing) levels or rows, but only by making partnerships, citizens really start to gain influence in the process of decision-making (Arnstein, A Ladder Of Citizen Participation, 2007).

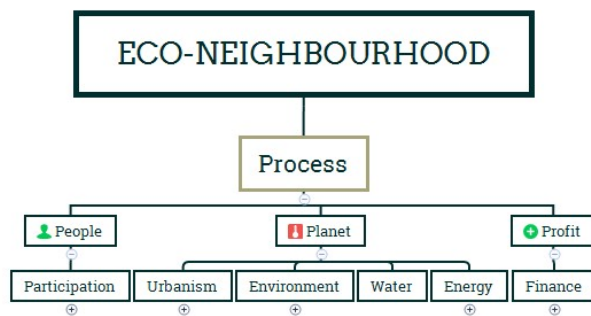


Figure 2.2 Eco-neighbourhood framework (Author, 2017)



Figure 2.3 Ladder of citizen participation (Arnstein, 1969)

### Urbanism

Within a neighbourhood, urbanism plays the role of integrating several themes at once. The importance to create and enhance urban ecology is high, where the living and working environment give space to a vivid integration of urban, natural and agricultural elements and functions. Both the public and private outside area should be characterized by ecological diversity and sustainable usages (Gemeente Culemborg and Stichting EVA, 1998). Furthermore, mobility and types of housing are highlighted subjects in urbanism, since these factors shape the diversity of an urban plan (Isabela Velázquez, 2009).

### Environment

The environment includes the cohesion of the built environment and its landscape surroundings. (stichting E.V.A., 2012) The integration of the flora & fauna and the respect for the existing landscape is of great importance. The cultural-history of the project area is found by identifying the genius loci. The genius loci are about the culture, character and atmosphere that runs through a city and in this case, the neighbourhood. It is important that a genius loci is identified during a research or design process.

Also, to integrate nature and the built environment the concept of permaculture is used. Permaculture has been defined a long time ago by several professionals, the first ones being Hopkings (1910) and King (1911). Permaculture, deriving from 'permanent' and 'agriculture', has developed over the past century and a common definition is described:

*'an integrated, evolving design system of perennial or self-perpetuating plant and animal species useful to (hu)man(s). Also, it is perceived as the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems.'* (Mollison, 1988)

Permaculture has been further analysed in the paper of Jungho Suh (2014) where the most important principles are described. It is a system for designing and creating human habitats that are in line with nature's patterns and it uses natural resources sustainably. There are four main principles:

1. Caring for the earth;
2. Caring for people;
3. Setting limits on population and consumption;
4. And redistributing surplus (Suh, 2014).

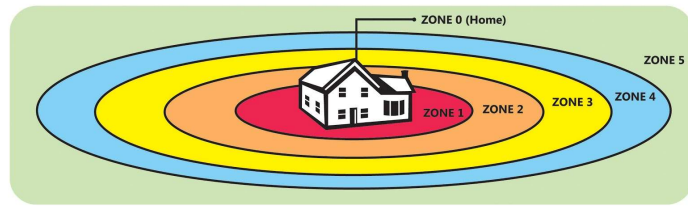


Figure 2.4 The six zones of permaculture (Padmin, 2016).

Furthermore, permaculture can be split up in several zones, to make it more accessible for integration. Six interacting zones have been defined and can be seen in figure 2.4.

The six zones of permaculture within a neighbourhood were defined in several studies (Padmin, 2016) (Mollisson 1988). This research however uses the first five zones since the sixth zone encompasses the wild uncultivated natural areas, which are not existing in the project area.

### Water

An integrated water plan is essential when creating an eco-neighbourhood. For an integral water plan, it is important to identify all natural conditions. On lower-lying clay areas, the water should be drained above surface as much as possible. The water theme works together with several other themes such as the opportunities in combination with energy, environment and urbanism (Pötz & Bleuzé, 2012).

### Energy

Creating energy and heat in a neighbourhood is based on the concept of Trias Energetica. Trias Energetica is the most applied strategy to incorporate energy-saving measures. By being efficient Trias Energetica means to be as sustainable as possible, using as much renewable energy sources as possible. It does not only include environmental aspects, but also financial aspects. Trias Energetica is also about becoming cost-effective: by taking energy-saving measures, money is also saved (Rijksdienst voor Ondernemend Nederland, 2013). It includes three main steps:

1. Limit energy demand;
2. Use energy from renewable sources;
3. Use fossil fuels in an efficient way.

The energy concept researched and applied in this thesis is called 'Wooneco' (Marsaki, 2017). WoonEco2 is a model that rises from the initiative of Marsaki and Architecten Alliantie. This concept offers a sustainable solution for the demand of energy efficient living and working. The concept is based on the passive building concept. This makes the first year of energy using less carrying. A wooneco2 building also uses sustainable energy and compensation is occurring for the fossil fuel use. This adds up to the concept of Trias Energetica. Wooneco will be used and applied in the creation of an eco-neighbourhood and is a handy tool to tackle the problem of energy usage. Wooneco2 builds further on the concept of Trias Energetica. Interviews with Patrick Harting explain more of the model and how to apply to different neighbourhoods (Marsaki, 2017).

### Finance & process

A project plan should be realistic and cost-effective while integrating all previously mentioned themes. To create a successful and cost-effective project plan, the process is of great importance. Redevelopment and revitalisation present opportunities to work on improving the living environment step by step and project by project, integrating all themes and relevant stakeholders in their field of study (Pötz & Bleuzé, 2012).



## 2.4 Area-analysis

### 2.4.1 Project area

First, it is important to identify and describe the specific project area. As can be seen on the map on this page, the project area is in the province of Zeeland, the Netherlands. Zeeland is a province surrounded by a lot of water. Zeeland is susceptible to the impacts of the changing climate and in the past a lot of developments have been executed to deal with it (Rijkswaterstaat, 2016).



Figure 2.5 The location of Goes within Zeeland, between the port of Rotterdam and Antwerp (Author, 2017).



Figure 2.6 The location of Goes-Oost within Goes (Google, 2017).



Figure 2.7 The specific project area (Google, 2017).

Goes is the specific city of the project area. Goes is a vivid city and is in the centre of the province of Zeeland, as can be seen in figure 2.5. Goes functions as the centre for the surrounding villages in Zeeland and accommodates many companies, schools and other facilities. Goes itself is separated in several districts, the northern/western/southern and eastern district. The project area is in the Eastern district of Goes, as can be seen in figure 2.6.

The first area built in this neighbourhood was the 'Bloemenbuurt' in the 30s. It was popular among the inhabitants of Goes. After that, a new villa neighbourhood was built next to the Bloemenbuurt and a big area of residential care complexes and the new neighbourhood with a lot of apartments and a lot of terraced houses. The specific buildings in the project area were built in 1948 and are therefore outdated. This comes forth from the 'Basisregistratie Adressen en Gebouwen (BAG)'. The neighbourhood is called the 'Verzetsheldenbuurt' and lies near the city centre (figure 2.6).

It is also close to rural area of Zeeland and has a good spot since it lies within an urban area but also has the calm ambiance of the rural area. The Verzetsheldenbuurt has a northern border with street name 's'Heer Elsdorppweg', a western border named 'de Koninginneweg', an eastern border with the houses at the 'M.D. de Grootstraat' and a southern border with the 'Kamperfoeliestraat'. Figure 2.7 shows the exact location and shows that a few houses south of the Kamperfoeliestraat are involved, because it is property of the corporation RWS. The project area has been measured and the total area to be restructured is roughly 40000 m<sup>2</sup> (4 ha). An important quality and problem in the neighbourhood can be seen in figure 2.8 and 2.9.





*Figure 2.8 Most important problem in the neighbourhood, shown from the PC. Quantstraat (Author, 2017)*



*Figure 2.9 Most important quality in the Verzetsheldenbuurt, shown in the Kamperfoeliestraat (Author, 2017)*

## 2.4.2 Layer-analysis

### Genius Loci

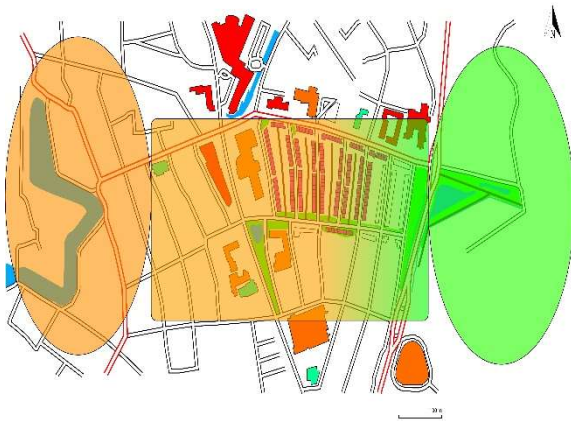


Figure 2.10 The transition from urban area (orange) to rural area (green) (Author, 2017).

The project area distinguishes itself from being the transition zone between the urban centre of the city of Goes, and the rural area at the border of the city, connecting the villages, such as Kloetinge (figure 2.10). This purpose has evolved since the Middle Ages and resulted in the creation of a post-war neighbourhood. The area identifies itself as the centre for education (primary and secondary schools for various religions and levels) and health care. This offers opportunities for the project area. The observations can be seen in appendix 1.

### Substrate and network layer

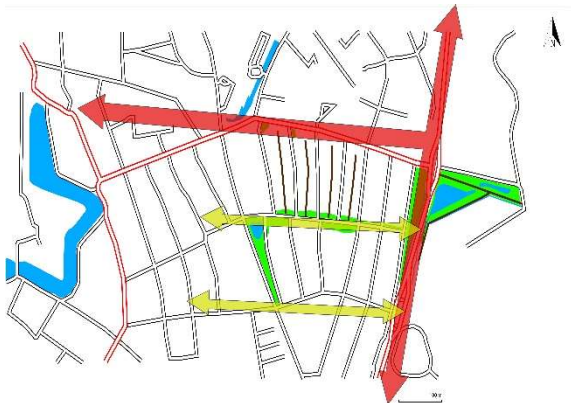


Figure 2.11 The flows of traffic (Author, 2017).

The substrate layer reveals the lack of water in the project area, since existing water bodies are too separate from each other. Also, the layer reveals a lack of public green. The only public green directly linked to the Verzetsheldenbuurt can be found in the Kamperfoeliestraat. This shortcoming contributes to the lack of 'air' and decrease in quality of life in the neighbourhood. The network layer shows two main flows: The main street area is busy and provides the most noise, connecting the urban and rural with each other. (The red flow in figure 2.11) The yellow

flows in the figure show the smaller streets that have a lot of school traffic during the day and are located nearby the project area. Existing infrastructure is outdated and needs improvement.

### Occupation layer

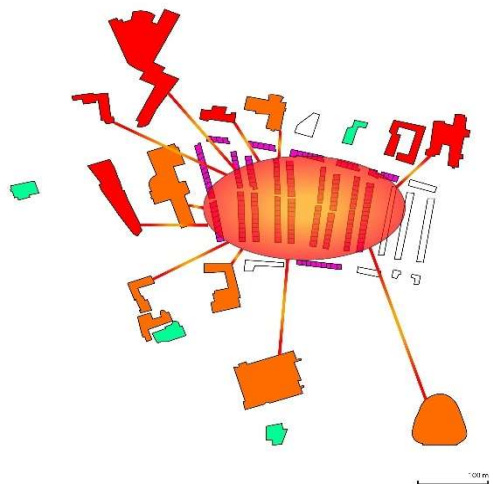


Figure 2.12 The availability of facilities in the project area (Author, 2017.)

The area consists of 138 social rent houses divided over five streets. As can be concluded from the layer-analysis, the properties of the owners have been split up into two parts: private ownership and corporation ownership. It will be hard to include the housing clusters in the project that include private property. the project area is surrounded by schools and health care centres. This brings a lot of opportunities and can be a pillar to build on in the project plan. The only thing the neighbourhood lacks is a nearby supermarket. See appendix 1 for the complete occupation layer analysis.



The results of the layer-analysis are incorporated into a SWOT-analysis, where the most important strengths, weaknesses, opportunities and threats will rise.

### 2.4.3 Stakeholder analysis

An important facet of project development is the inclusion of all the important relevant stakeholders and is defined as followed:

*'A stakeholder in an organization is any group or individual who can affect or is affected by the achievements of the organization's objectives.'* (Freeman, 1984)

<b>Schools</b>	Goesse Lyceum Ostrea Lyceum De Wissel Auris College Prinses Ireneschool Ernst Bisschopcollege
<b>Firms</b>	Marsaki RWS Evides Delta
<b>Inhabitants</b>	Community centre Goes-Oost Current inhabitants Future inhabitants Maros butcher MAR
<b>Municipality of Goes</b>	
<b>Health Care</b>	SVRZ Ter Valcke Health care centre Randhof Gors Rehoboth
<b>Press &amp; Media</b>	Regional media ANP National magazines
<b>General interest</b>	Inhabitants of Goes Project developers Architects Contractors Agents Urbanists

Table 2.1 Stakeholder analysis.

Stakeholder involvement is one of the key aspects in project development and that is why a concrete stakeholder analysis must be executed. These stakeholders can then optionally be interviewed on their perspectives of eco-neighbourhoods. The stakeholder analysis resulted in a table including all the relevant stakeholders as is shown in table 2.1. A detailed stakeholder analysis and stakeholder matrix can be found in appendix 2.

To be concluded, the stakeholder analysis shows that this project area has a lot of opportunities since it houses numerous health care and educational facilities. There are schools present for nearly all level types and age categories and there is a wide range to choose from. As for the health care centres, they do not only offer housing for the elderly, but also house several wellness related facilities such as fitness and physiotherapist opportunities.

### 2.4.4 SWOT-analysis

A SWOT-analysis is simply defined as: 'SWOT analysis is a process that identifies an organization's strengths, weaknesses, opportunities and threats (Investopedia, sd).' A SWOT is further seen as a tool, or analytical framework, that identifies and shows what in this case the different entities of the project area are. It reveals the project area's internal forces, such as strengths and weaknesses, or external forces, such as the opportunities and threats. The framework is useful to make these entities visual and more tangible. The SWOT-analysis can be found here including a short conclusion on the most important findings in the area analysis. Site visits in the Verzetsheldenbuurt, internal data and meetings with stakeholders such as RWS, Marsaki and the Gemeente of Goes form the basis of the Verzetsheldenbuurt (table 2.2).

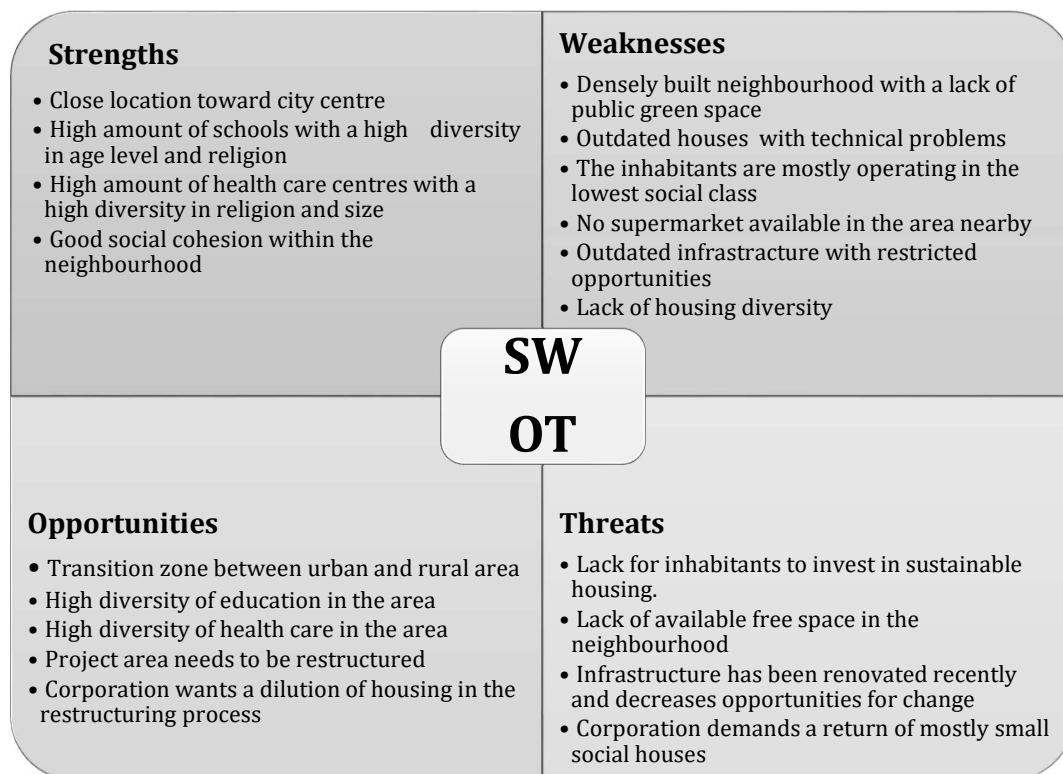


Table 2.2 SWOT-analysis of the project area 'Verzetsheldenbuurt'. (Author, 2017).

The area analysis has shown that the Verzetsheldenbuurt distinguishes itself from being the transition zone between the urban centre of the city of Goes, and the rural area at the border of the city, connecting the villages, such as Kloetinge. The area identifies itself as the centre for education (primary and secondary schools for various religions and levels) and health care. This offers opportunities for the project area.

As can be seen in the SWOT-analysis, a lot of weaknesses are related to the problems of housing and infrastructure. By making a new vision, the opportunities to tackle these weaknesses are high. The most significant opportunities in the neighbourhood are the high presence of education and health care. These opportunities should come back in the new vision for the project area and can be a tool for promotion. The most important conclusion is that an analysis is needed to how participation and social cohesion can be created, since this is one of the most important themes in creating an eco-neighbourhood.







## 3. Methodology

This chapter explains the methods that are used during the research. It elaborates how and why a certain method is used to answer the main and sub questions. This research consists of both qualitative- and quantitative methods. Qualitative research is primarily about exploratory research. It is used to gain an understanding of underlying reasons, opinions and motivations (Wyse, 2011). It is qualitative research because it has a high social factor and this research is about an emerging trend of sustainability, which includes a lot of external social forces.

This research also consists of quantitative research. Quantitative research was used to quantify the problem by way of generating numerical data or data that can be transformed into useable statistics (Wyse, 2011). A part of this research, especially in the latter part where the pilot will be elaborated, data is going to be acquired. For example, to acquire numerical data of finances of several measures, internal quantitative data was needed.

During this research, different methods were used to answer the main question: desk research, data collection and a case study research. Whilst it is possible for dissertations to be entirely literature-based, this research eventually takes the form of a pilot study. Here the focus of attention is on a neighbourhood, which has been described earlier.

### 3.1 Desk research

Desk research is an important factor in this research because a lot can be learned from existing knowledge and previous researches of eco-neighbourhoods. The emerging trend of self-sufficiency and the rise of the information era provides knowledge on the subject and therefore desk research is relevant. Use of internal data and external data was applied (Nicolas Baud, 2002). External data is mostly published material, computerized databases and syndicate services. The published materials came from Google Scholar and Science Direct. These are two databases that include an in-exhaustive number of published journals, reports and books. Also, the normal 'Google' search engine has been used because not only scientific articles are of importance. Various search terms were used such as 'sustainable neighbourhoods' or 'self-sufficiency'. Desk research is the first phase of this research and is used to answer sub questions 1 and 2. Furthermore, it was used to find some of the important case studies, elaborated in the next paragraph. The literature was reviewed carefully. One source has been of extra value since this already includes the most valuable themes and is called Urban green-blue grids for sustainable and dynamic cities by Pötz & Bleuzé in 2012 (Pötz & Bleuzé, 2012).

### 3.2 Case studies

"A case study research is an in-depth study of a situation rather than a sweeping statistical survey. It is a method used to narrow down a very broad field of research into one easily researchable topic." (Shuttleworld, 2014) The research of creating eco- neighbourhoods has been done and implemented already and there is enough information to be found on the subject. Several implementations can be researched and will form the basis of the eco-neighbourhood catalogue. By analysing the implemented options and accompanying risks, an overview can be created. The possible case studies that could be researched are based on the following criteria;

- Integration of self-sufficiency themes and relatable measures;
- Comparable size to the neighbourhood in Goes-Oost;
- Transparency and availability of data.

The following case studies have been chosen based on the criteria:

- Eva-Lanxmeer, Culemborg, NL (stichting E.V.A., 2012)

- Olmentuin, Steenberg, NL (Marsaki & Compositie 5 Stedenbouw, 2016)
- Hof van Heden, Hoogvliet, NL (Vereniging Hof van Heden Hoogvliet, 2016)

### 3.2.1 EVA-Lanxmeer

EVA-Lanxmeer is a neighbourhood that strives to combine living with working, recreating, drink water winning, education and producing food. The neighbourhood had high ambitions to combine cultural history, landscape, water, energy, use of material, mobility and participation in developing a sustainable neighbourhood (stichting E.V.A., 2012). In 1994, the EVA foundation, called 'Stichting EVA' was founded with a purpose of delivering a contribution to the development of a sustainable and environmentally conscious society. By using an interdisciplinary collaboration, the foundation wanted to create an ecological neighbourhood while providing



Figure 3.1 Image of EVA-Lanxmeer, Culemborg (Author, 2017)

the public with all knowledge acquired in the developing process. A new model was created with other experts: EVA-concept. This concept contained several criteria for the urban plan. Design principles were developed for all locations. These principles were of great relevance and the EVA-concept has been a success in practice. The goal to involve inhabitants in the beginning process of the project and to make them help shaping the sustainable living environment and giving them more authority has been achieved. The 'life style' of adults and children has become more sustainable and this can easily be demonstrated (stichting E.V.A., 2012). Authority is achieved on neighbourhood level and the built houses increased community involvement and quality of life. The neighbourhood stays attractive and its real estate value has been maintained. These are the most important qualities according to the interview with Marleen Kaptein (Appendix 3.1). Furthermore, there are various success factors that could help a project. A well-funded story must be created that shows clear ambitions and makes the owner enthusiastic, since ground acquisition is necessary to realise the initial ambitions. For a detailed analysis of this case study see appendix 3.

### 3.2.2 Hof van Heden

Hof van Heden, which is in Hoogvliet, was not just a usual neighbourhood. Being a district of the highly-urbanized area of Rotterdam, it was necessary to create a neighbourhood that met the demands of the future (Vereniging Hof van Heden Hoogvliet, 2016). An initiative started where a cooperation emerged between Welcome in my Backyard and Vestia (social housing corporation) (Hiltrud Potz, 2009). A group of residents were given the opportunity to give their input on the design of the housing project. The future inhabitants were involved by doing workshops along the process, and had authority in the creation of the design, which was done by architecture firm opMAAT. This case study has been chosen resulting from the interview with Pierre Bleuzé (Appendix 3.2). He explained that



Figure 3.2 Image of Hof van Heden, Hoogvliet (Author, 2017)

Hof van Heden serves as a good case study where a combination of themes has been implemented such as water, energy, participation and biodiversity. The themes, as defined in the theoretical framework, will function as the guideline through the process. This project has proven itself to be successful on all aspects. It shows that the only way to be successful is by using a participatory and integrated approach working together with inhabitants, the architectural firm, corporation and municipality. For a detailed analysis of this case study see appendix 3.

### 3.2.3 Olmentuin

The Olmentuin is about the creation of a sustainable, energy-neutral neighbourhood between the green, where people have all the facilities within reach, such as health care, shops and cultural activities in Steenberg. This neighbourhood is still in the developing phase. Doing research to this case study offers comparable process steps.



Figure 3.3 Artist impression of the Olmentuin in Steenberg (Olmentuin, 2017)

There are a few assumptions for the urban plan that make this neighbourhood suitable for this research since it is a comparable project to EVA-Lanxmeer in Culemborg, using an integrated approach. The idea of doing research to the Olmentuin comes forth from the interview with Patrick Harting (Appendix 3.3). For a detailed analysis of this case study see appendix 3.

During this research, more case studies have been analysed and used as reference for ideas to implement in the neighbourhood in for example the urban plan and reference images. When previously implemented projects have been used, a reference will be indicated. Other references in the design are taken from:

- Ruwenbos, Enschede: a project where wadi's flow through the neighbourhood and are dry 85% of the year (Pötz & Bleuzé, 2012).
- Westhausen, Frankfurt: An early project, which was a pillar in building sustainable and has a significant ordering structure. The concept has been widely used and comes back in the first scenario (Westhausen, 2016).
- Begijnhof, Breda: Another project that involves a communal garden with optimal social cohesion (Breda, 2014).

## 3.3 Interviews

Doing interviews is a form of collecting primary data. To make case study research more reliable, important stakeholders relevant to the specific case study were interviewed. Baarda (2012) separated doing interviews into two types: structured and unstructured. Structured interviews are quick and easy to administer since they are mostly about following a certain questionnaire. Unstructured interviews on the other hand, do not reflect any preconceived theories or ideas and are performed with little or no organisation. Unstructured interviews are time consuming and therefore this research tries to meet the structures halfway: semi-structured interviews. This type of interview tries to follow a guideline of several key questions that help to define the areas to be explored and in this research, this has served to be the most suitable option (Baarda B. , 2012). The population of the research is based on the stakeholder relevance and can be found in table 3.1 (David and Sutton, 2004).

Stakeholder	Relevance to research	Answering question
<b>Stichting EVA – Marleen Kaptein</b>	The creator of the EVA-concept	Sub question 1 & 2
<b>Pierre Bleuzé</b>	Involved architecture in both EVA-Lanxmeer and Hof van Heden	Sub question 1, 2 & 3
<b>Patrick Harting</b>	In-company project manager and sustainability advisor at Marsaki	Sub question 1, 2 & 3
<b>Walter Koens</b>	Continuous meetings	All sub questions
<b>Perry Zijlema</b>	Urbanist Municipality of Goes	Sub question 3

Table 3.1 Interview population

The interviews were recorded and analysed by looking at the answers of the interviewees. Some interviews were transcribed and some have a thorough summary. All of them have been coded and labelled using the defined eco-neighbourhood themes.

### 3.4 Application

The final part of the research is about showcasing the previous research in the form of a pilot project, which is also the main research's main goal. All the acquired data and results from the previously explained methods, should be applied to a certain project area, which has been analysed in the theoretical framework. The main question encompasses a certain area in Goes-Oost. This will be relevant for both the company and research purposes. This process includes the normal procedures for doing area development according to the study of the Delta Management. The results will be ordered by creating a main vision, divided in the previously defined themes resulting in a schedule of requirements. This vision should lead to a concept design and proper recommendations. The thesis defined this part as applied research: the application of the acquired material to a specific area, to proof the results as valuable and reliable.

It is hard to create a design and that is why a method was used that follows a path into design creation. Jean Noel Kapferer defined design in 2004 as 'a continuous process that gives value to a product, with the result to give it a better use, making it cheaper and making it more beautiful.' This is also called 'design thinking' and the process is shown in figure 3.4.

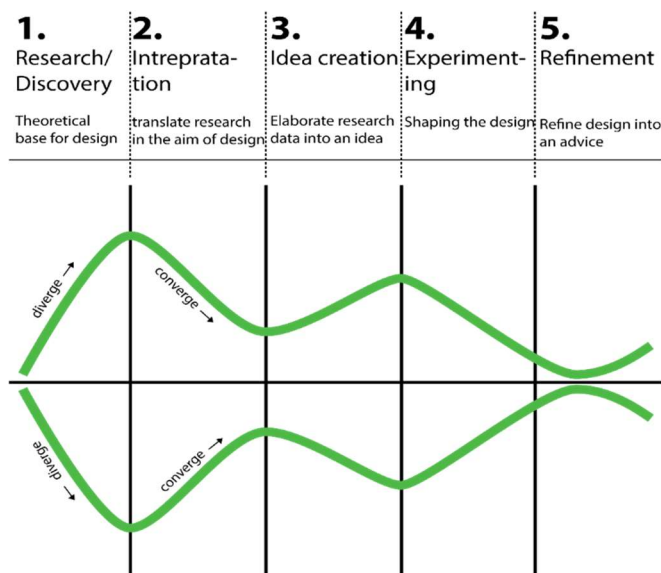


Figure 3.4 Design thinking process

First, it was important to do proper research while identifying the needs of an organization. Extensive knowledge, understanding and empathy were central in this phase, as well as finding background information. Then, field observations were central before implementing the research into the aim of a design. The third step was to create ideas and putting them into a general vision for an area. Subsequently, Experiments to different options was executed. This was also done by



looking at the different case studies and their outcomes. Lastly, a design was created that includes all previous research, in the form of spatial concepts. To remain as realistic as possible, the research will be ended by a financial analysis, including a study to the feasibility of the eco-neighbourhood. This will be achieved by doing a quantitative analysis in the form of a cost-benefit analysis. (Businessdictionary, 2017)

### 3.5 Validity

Research material may not be reliable or validate. It is a necessity to use as many sources as possible. There are different methods to reach this goal. The quantitative data is mostly going to come from internal data of Marsaki, where the research is going to be conducted. This is a reliable source of information since they are experienced in doing these types of measurements.

As for the qualitative data, it has different properties. Qualitative data has no real number on it and looks more at social science. To proof the reliability of the qualitative data a method described in the books of Verhoeven, 2011 and Baarda, 2010 provide useful recommendations to use during the research (Verhoeven, 2015).

1. Credibility: combining different sources of literature, methods and theories to provide as much evidence as possible.
2. Transferability: The role of the researcher and the framework that will be researched.
3. Dependency: The research needs to be clear for readers that are not involved in the research. The documents should be complete and clear about the data analyzing methods.
4. Confirmation: a personal logbook must be kept up to ensure the objectivity of the research (Verhoeven, 2015).

To ensure the internal data to be a reliable source, all the thoughts during the research will be written down in a logbook to ensure that all opinions are considered. Reliability is obtained if research is reproducible. Results are valid if the outcome is the same when the research has been conducted multiple times (Verhoeven, 2011).

Validity is secured by approaching the research from different viewpoints, as has been explained by Baarda in 2010 (Baarda B. , 2010). The interviews are conducted with stakeholders that all have other perspectives since there were multiple case study interviews. Also, the vision and design concepts have been analyzed by multiple professionals (Appendix 3 + 6).

To ensure that interim findings are realistic, member checking will be used (Baarda B. , 2010). Interim research results will be discussed with fellow colleagues at Marsaki since they have more knowledge in this field of expertise. It must be said that when creating a vision, own interpretation is used as a method. The process steps have been written out as thoroughly as possible to increase reliability of the vision and designs.



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## 4. Results

This chapter discusses the results of the research and will contain all relevant information to answer the main question and remaining sub questions. The structure will follow the conceptual framework, elaborated in the theoretical framework. First, the most important possibilities of creating an eco-neighbourhood, based on desk research, interviews & case study research, were written out and serve as a catalogue. Then, the most important options for the project area are developed, based on the area-analysis and its SWOT-analysis. This led to a vision and a series of spatial concepts for the project area and concludes the results chapter.




### 4.1 Eco-neighbourhood catalogue





The eco-neighbourhood catalogue is a result from case study research (appendix 3) and desk research (appendix 5) to all the separate themes incorporated in the eco-neighbourhood framework. The following table will show a compact summary and description of each of the measures relevant to the themes as well as the risks and pitfalls found per theme. The summary of the catalogue can be found on the next page and the detailed eco-neighbourhood catalogue can be found in appendix 4. The catalogue serves as the basis for the vision of the Verzetsheldenbuurt.

### 4.2 Opportunities

Resulting from the area-analysis and eco-neighbourhood catalogue, the project area's most important opportunities and options have been identified. The SWOT-analysis showed the opportunity to use the Verzetsheldenbuurt's ambiance. It serves as a transition zone between the urban and rural area and has a vivid character since it is a passage for schools and health care centres. Dilution of housing in the neighbourhood creates space and offers options to create a communal green area. This also generates opportunities to integrate disconnected and above-water drainage, since there is a bigger surface to distribute. Restrictions in opportunities lie however in the financial feasibility and all process steps should stay as realistic as possible. Marsaki, RWS and the Municipality of Goes do not offer any additional funds other than the usual amount of money laid out for a life-cycle house. Additionally, the target group will have a low potency to invest in sustainability and possibly have no interest in becoming sustainable. On the other hand, if the neighbourhood might become energy neutral, this will offer chances for these inhabitants since it saves a lot of their annual costs. The opportunities together with the results from the area analysis have resulted in an overall vision for the neighbourhood.

Tabel 4.1 Eco-neighbourhood catalogue summary

THEMES	OPTIONS
<b>WATER</b> 	<ul style="list-style-type: none"> <li>• The catchment of rain water from building roofs</li> <li>• Helophyte filters</li> <li>• Above ground precipitation drains and buffers</li> <li>• Fluted gutters</li> <li>• Buffering and infiltration</li> <li>• Wadi's</li> <li>• Wetlands</li> <li>• Rainwater ponds</li> <li>• Seasonal storage</li> <li>• Nature friendly bioswales</li> <li>• Disconnection from the drainage system</li> <li>• Rain tons in homes</li> </ul> <p><b>RISKS</b></p> <ul style="list-style-type: none"> <li>• Nutrients can't be purified by natural system</li> <li>• The catchment of water uses a significant amount of the project area's surface</li> </ul>
<b>ENERGY</b> 	<p><b>Individual</b></p> <ul style="list-style-type: none"> <li>• The wooneco2 concept offers a sustainable solution for the demand of energy efficient living and working. The concept is based on the passive building concept and follows the concept of Trias Energetica (appendix 3)</li> <li>• Geothermal pump</li> <li>• Optimal use of passive solar energy</li> <li>• Low-temperature wall heater</li> <li>• The creation of a low-temperature heat network</li> <li>• The winning of heat from ventilation</li> <li>• Energy storage battery</li> <li>• Small-scale wind energy</li> </ul> <p><b>Collective</b></p> <p>The other way to look at energy use, supply and demand within a neighbourhood is about collective energy use.</p> <ul style="list-style-type: none"> <li>• Collective energy network</li> <li>• Share heat with neighbours</li> <li>• Involving electric cars</li> <li>• Collective energy networks are still in a development phase but might offer long-term solutions (appendix 4).</li> </ul> <p><b>RISKS</b></p> <ul style="list-style-type: none"> <li>• Comfort of inhabitants should remain the main goal</li> </ul>
<b>URBANISM</b> 	<ul style="list-style-type: none"> <li>• <b>Mobility:</b> Using shared rental cars, the placcation of parking lots out of sight and decreasing the parking space rate. Also, there is the option to create a car free zone as is incorporated in EVA-Lanxmeer. Inhabitants are only allowed inside to load and unload. Also, the importance of changing the infrastructure should be included</li> <li>• Diversity in housing types</li> <li>• Good integration of public green space and small clusters of buildings to create enough 'air' in the neighbourhood</li> <li>• Small private gardens, connected to a communal garden</li> <li>• Green roofs</li> </ul> <p><b>RISKS</b></p>

<p><b>ENVIRONMENT</b></p> 	<ul style="list-style-type: none"> <li>• The possibility of failure in social cohesion, as a result from the small private gardens connected to a communal garden.</li> </ul> <ul style="list-style-type: none"> <li>• A cooperation between human and nature</li> <li>• the importance of autonomy</li> <li>• recycling material and processing garden waste</li> <li>• development of self-sufficient systems and the creation of circular cycles</li> <li>• the usage of sustainable water and energy sources</li> <li>• the improvement of the local food production by implementing fruit trees instead of normal trees</li> <li>• The creation of a natural border of private gardens instead of fences</li> <li>• Use of public greenery</li> <li>• Development of a communal kitchen garden, which can also serve as a meeting place</li> <li>• Green parking lots</li> <li>• The permaculture concept should be running through the project plan</li> </ul> <p><b>RISKS</b></p> <ul style="list-style-type: none"> <li>• High level of maintenance is needed</li> </ul>
<p><b>PARTICIPATION</b></p> 	<ul style="list-style-type: none"> <li>• The creation of a foundation for inhabitants that offer collaborating principles such as neighbour-help, doing shopping together, collaborating maintenance, insurances, health care and sharing materials</li> <li>• Participation from potential inhabitants should be incorporated from the start of the project</li> <li>• Excursions to existing eco-neighbourhoods with future inhabitants</li> <li>• The creation of communal gardens, where renters agree to buying a part of the communal garden, which enhances participation and the sense of attachment to the place</li> <li>• Shared car project</li> <li>• Give the responsibility of maintenance of gardens to the inhabitants</li> <li>• Form working groups of different professionals and potential inhabitants</li> </ul> <p><b>RISKS</b></p> <ul style="list-style-type: none"> <li>• Participation must remain small-scale</li> <li>• Large scale participation decreases sense of community</li> </ul>
<p><b>FINANCE</b></p> 	<ul style="list-style-type: none"> <li>• Subsidy possibilities</li> <li>• Financial benefits due to participation</li> <li>• Reduction of maintenance costs</li> </ul> <p><b>RISKS</b></p> <ul style="list-style-type: none"> <li>• Cost-benefit analysis is merely an estimation and might not be realistic</li> <li>• Social benefits attached to an eco-neighbourhood aren't numbers</li> </ul>
<p><b>PROCESS</b></p> 	<ul style="list-style-type: none"> <li>• A well-funded story that shows clear ambitions and should make the owner enthusiastic</li> <li>• A selection of skilled professionals is necessary that are willing to cooperate, which benefits the project.</li> <li>• A common goal should be set between the different disciplines to overcome possible problems and issues.</li> <li>• Include the different interests and insights of the key stakeholders</li> </ul>

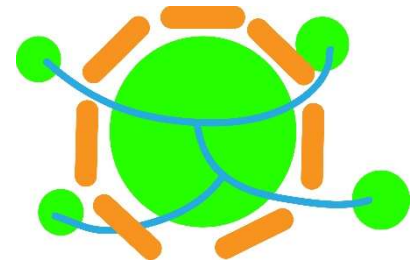
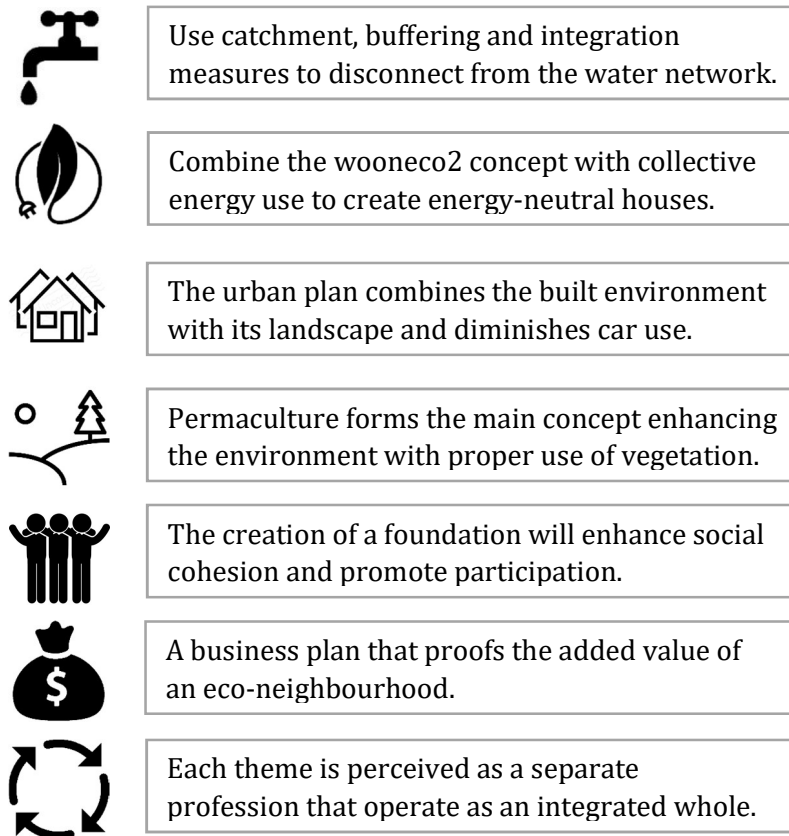
### 4.3 Vision & strategy

The vision for the Verzetsheldenbuurt responds to the conclusions from the previous theoretical research about the creation of an eco-neighbourhood combined with the conclusions from the area analysis and eco-neighbourhood catalogue.

Goes has always been and still is the centre of Zeeland, connecting all the surrounding villages. This vivid city forms the perfect location for a new neighbourhood and has good connections for public transport. The Verzetsheldenbuurt in Goes-Oost has always been a post-war district, characterized as a 'modernistic' and 'functionalist' area. Over the decades, the area has changed in quality and perspective but still has its unique location near the city centre. Also, the neighbourhood accommodates a lot of valuable facilities that are not yet promoted as such. It is time to seize the opportunities the Verzetsheldenbuurt offers.

The vision is about creating an ecologically sustainable neighbourhood operating in an urban area, connecting the vivid city centre of Goes with the calm agricultural hinterland. The Verzetsheldenbuurt will have a focus on green and water, creating a family-friendly neighbourhood, targeted at various population groups. Its unique location will be pursued, being located near the city centre as well as having numerous schools, religious places and health care facilities at its disposal. To achieve the goal of this concept, an integrated correlation between the most important themes will be realised, namely: water, energy, urbanism, environment, participation and process. By using a holistic and participatory approach, the Verzetsheldenbuurt meets the high demand of the future and will increase the quality of life within the urban area of Goes as well as the social and ecological environment.

Housing will get an accessible and sustainable look, targeted at the lower class in society. Housing typology is based on demographics and presence of facilities in the area, resulting in a combination of single-family, life-cycle houses with senior apartments. They will be oriented at the sun as much as possible to optimize energy use. A communal garden will serve as the centre of the neighbourhood, getting a green appearance, including permaculture (fruit trees) as well as being a playground and meeting place for both children and adults, and providing an open appearance to the rest of the area. The communal kitchen garden implemented in the neighbourhood will get the name of a resistance hero and therefore uses the Genius Loci as pillar. The green-blue ambiance and network will be the main atmosphere running through the Verzetsheldenbuurt. The main opportunities hide in the creation of a neighbourhood that breaths air and quality to the living environment while also creating the atmosphere of an urban neighbourhood. Sustainable living in the Verzetsheldenbuurt is the key principle, enjoying the vivid city centre or surrounding natural areas while having cultural, social and medical facilities at your disposal. The vision has been elaborated per theme in detail in the next sub paragraphs.



*Figure 4.1 A visualization of the vision, connecting green-blue grids (Author, 2017).*



### 4.3.1 Water



Use catchment, buffering and integration measures to disconnect from the water network.



Figure 4.2 Reference image of a green roof in combination with PV panels (Greenscape, 2017).



Figure 4.3 Reference image of water playground in combination with above-water drainage (EVA-Lanxmeer, 2017).



Figure 4.4 Reference image of a nature-friendly wadi (Kronsberg, 2017).

The goal in the Verzetsheldenbuurt is to disconnect from the water network as much as possible by using existing water flows. The most important water flows identified are rain water, drink water, grey water and black water (sewage waste water) (appendix 3).

**Rainwater** is the most essential flow to save water in comparison to a normal neighbourhood. To collect the rainwater as much as possible a reduction of paved areas will occur. Parking lots and streets will get porous paving materials, which enhances water infiltration. Also, green roofs on the flat surfaces of apartments will form a collection zone. Water collected from the houses and apartments will flow through the neighbourhood by using above drainage techniques such as fluted gutters, and will be released in buffering and infiltration zones. These infiltration zones consist of nature-friendly wadi's (bioswales) and vertical helophyte filters, located in the communal green space, where the rainwater will be purified as much as possible. When purified, the water will be reused in toilets and washing machines and will therefore not flow into the main water network. This already results in a partly self-sufficient water network. The natural water purifying system eventually releases the water in the surface.

**Grey water** is used water coming from taps and showers in homes and will be collected and purified locally in wadi's and vertical helophyte filters. The purified grey water will be reused in toilets and showers as much as possible to close the water system. Now, the water used in toilets and showers is drink water and not used sustainably. Reusing grey water will release the neighbourhood from the main sewerage system. Vertical helophyte filters however, have proven to be difficult and costly to implement (appendix 6.1).

**Drink water** is the only flow that is not self-sufficient yet since the purified water does not meet the demands of water legislations. Future research and innovations to improve buffer and irrigation measures are happening. Drink water and possibly black water are therefore the only flows that are still connected to the main water grid. Water in the Verzetsheldenbuurt does not only improve quantitative flows but also increases qualitative entities. The above-water drainage system will be combined with a water playground for children and will enhance the living environment of the neighbourhood. The most important preconditions for the water network within the Verzetsheldenbuurt are:

- Paved areas will be reduced as much as possible.
- The construction of helophyte filters and wadi's will disconnect the rain water and grey water from the main water grid.
- Above water-drainage will enhance the living environment and generate a playground.
- The long-term vision includes self-sufficiency in drink water.

### 4.3.2 Energy



Combine the wooneco2 concept with collective energy use to create energy-neutral houses.

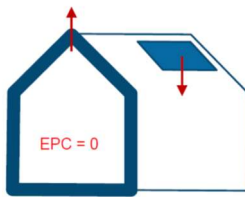


Figure 4.5 A visualization of a house with good isolation and using PV panels (Wooneco, 2017).



Figure 4.6 Reference image of an electric car parking (EV Project, 2010).

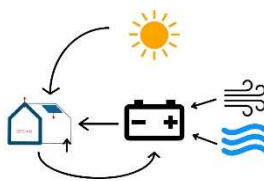


Figure 4.7 Long-term energy vision of the Verzetsheldenbuurt (Author, 2017)

The main vision of the energy theme within the Verzetsheldenbuurt is to combine the Wooneco2 (figure 4.5) concept with collective energy use to create energy-neutral houses. This combination will lead to the houses fulfilling the BENG-principles and following the Trias Energetica concept.

The **individual** houses apply specific measures that make sure the goals are achieved. The houses in the Verzetsheldenbuurt will get an optimal orientation, mostly to the south. There will be a focus on proper isolation and maximum airtightness by applying triple helix glass and creating a heavily isolated hull, which results in a minimal warmth loss. The minimum heat demand will then be achieved by installing an all-electric installation. Subsequently, the roof will be provided with a minimum number of PV-panels to further compensate for the energy demand. By applying this measure of becoming climate neutral or NOM, more investments are done to the hull of the house instead of the installations. Also, this offers opportunities to the renters to find other ways to reach the energy demand. The additional energy demand will be tackled by installing small CHP pumps. (geothermal pumps) To tackle the risks of a warm indoor climate due to extra isolation, perfect location of trees results in natural shade. Surplus excessive solar influence will be reduced by blinds.

When using the individual techniques, a lot of surplus energy and heat is generated, which eventually results in energy loss or a return to the main energy network. This results in an unsustainable use of energy that does not meet the long-term demands. However, it offers opportunities for **collective energy use** within the neighbourhood. The long-term vision for the Verzetsheldenbuurt includes a neighbourhood energy battery that has the ability distribute energy among different residents, when necessary and can collect and store the energy over seasons. This can be combined with the battery from an electric car, which is the future. For example, parking lots can each get an electricity battery. However, so far only the Tesla battery comes close to this technique and it is therefore still in a developing phase and further research is needed to implement this in the future.

Another opportunity contributing to the collective energy use is further research to the implementation of collective wind energy and water energy. The usage of these types of energy can contribute to the energy battery. By storing energy, no energy will be released to the main grid and complete self-sufficiency can be acquired.

### 4.3.3 Urbanism



The urban plan combines the built environment with its landscape and diminishes car use.



Figure 4.8 Reference image of orange tiles in Vlissingen (Vlissingen, 2017).



Figure 4.9 A road that cooperates with the natural area (Barnum)



Figure 4.10 The possible long-term vision of a meeting place (RegenVillages, 2017).

The Verzetsheldenbuurt wants to create a neighbourhood that combines the built environment and its city dynamics, with the surrounding natural landscape. The urban plan includes a combination of life-cycle houses and apartments targeted at small families and seniors. The houses and apartments will have a few important criteria that must be met:

- The houses should be located south as much as possible to collect the most energy possible.
- The houses will get small private gardens, all connected to the communal garden and kitchen garden, to enhance social contact.
- The roofs of the houses will get bright orange roof tiles to aid the city dynamics.
- The apartments will get green roofs in combination with solar panels due to its flat surface.

Apart from housing in the project area, **mobility** is also of great importance and looked at with great care. The most important criteria of the infrastructure are:

- The centre of the neighbourhood will be a car free zone.
- A load and unload policy will be applied, where it is only allowed to park your car inside the neighbourhood temporarily to load and unload.
- Parking lots will be created on all the borders of the neighbourhood to create fair parking distances for different houses. This will also make sure people won't park somewhere else in the neighbourhood of Goes-Oost.
- The street pattern will be changed if possible: The Marijkestraat and the Jacob Klaaijsenstraat will be restructured to give space to the communal garden. The houses will be built around this garden and the new road will flow around these houses in a circular direction.
- The roads will get green dynamics and become porous to gain water infiltration in the surface.
- The roads will get one-way traffic.

Furthermore, the ambiance going through the urban plan is the combination between green and blue grids. Collected water from houses will flow through the neighbourhood above the surface, raising the awareness of inhabitants, and will flow to the communal kitchen garden, which will also serve as a meeting place. Its location is of great value due to its close spot to the city centre. A 4-ha area is developed that gives space to long-term opportunities in self-sufficiency and closely cooperates with the environment.



#### 4.3.4 Environment



Permaculture forms the main concept enhancing the environment with proper use of vegetation.

Permaculture is the main concept running through the Verzetsheldenbuurt and will generate a neighbourhood with a great living environment. Five main zones have been defined that organize the environmental design element (Wageningen University, 2009) (appendix 5).

**Zone 0** is associated with the house, where the most important principles are the disconnection and sustainable use of water and energy. Zone 0 cooperates with **zone 1**, which includes the direct surroundings of the house, such as the private garden. Natural fences are an important factor to generate permaculture in the Verzetsheldenbuurt. Instead of using wooden or stone constructions, the private garden fences will consist of natural vegetation to create a more natural flow from private to communal terrain and will enhance biodiversity and creates a more circular ecosystem. By applying this principle, a circular ecosystem is created between the private gardens, communal gardens and kitchen gardens, which are all connected to the external environment (figure 4.11).

**Zone 2** includes the creation of a communal kitchen garden and forms the centre of the Verzetsheldenbuurt. There are options to create a green house, which can be a result from investments of the VBV (see participation). The communal kitchen garden will generate fruits and vegetables, cultivated by the inhabitants. This kitchen garden won't be enough for the neighbourhood to become fully self-sufficient since this would simply need too much space. The cultivated food will be sold and distributed among the inhabitants (figure 4.11).

**Zone 3 and 4** form the main crop production and semi-wild area that further enhance the local food production by planting fruit trees in the communal garden instead of normal trees. These trees need to be maintained and harvested throughout the year and therefore require a participatory approach. Apple trees and pear trees are the most used fruit trees and easiest to implement (figure 4.11). The **green-blue grids** running through the Verzetsheldenbuurt promote the creation of a self-sufficient system and generate the usage of sustainable water and energy sources. The interrelation of the water, energy and environmental system promote a level of permaculture in the neighbourhood. Integration of green roofs and reduction of paved areas will improve the living environment of plants and animals.

**Recycling materials** is one of the principles that aids the development of self-sufficiency. Therefore, the organic waste in the neighbourhood can be reused where possible in the communal kitchen garden. Reusing organic waste is a new way to become circular within the neighbourhood boundaries. However, this technique has proven to be disputed when it is not used properly. That is why further research must be done to the opportunities to reuse organic waste in the Verzetsheldenbuurt and might be a long-term solution. Recycling spots will be present in the neighbourhood at the parking lots as much as possible.

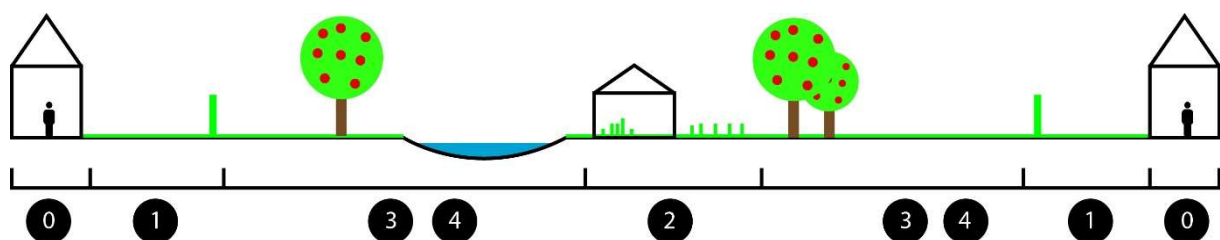


Figure 4.11 A visualisation of the different zones present in the permaculture concept, as is applied to the Verzetsheldenbuurt (Author, 2017).



### 4.3.5 Participation



The creation of a foundation will enhance social cohesion and promote participation.



Figure 4.12 Reference image that shows children playing in a kitchen garden (Berlicum, 2017).

Participation has proven to be the key principle in the Vezetsheldenbuurt and social cohesion will be enhanced, when applying on a small-scale level, by creating the foundation: Vezetsheldenbuurt BewonersVereniging (VBV). The VBV will be responsible for social dynamics within the neighbourhood with the main responsibilities being:

- Maintenance of the communal gardens: the communal gardens will be separated in smaller communal zones, instead of one big garden.
- The fair distribution of the communal tools among inhabitants.
- Organizing events such as cleaning days, barbeques and trips to other eco-neighbourhoods.
- Taking care of the contribution inhabitants make.
- Execute opportunities to share expenses such as insurances and health care.
- Organizing events such as educational trips within the neighbourhood.



Figure 4.13 Reference image of a communal garden. (Berlicum, 2017)

The Vezetsheldenbuurt will use the surroundings such as schools to promote education and will therefore be a pioneer within Goes. The communal kitchen garden can become an educational centre for young children to raise ecological awareness and improve participation. Also, the communal garden will serve as relaxing area and meeting place for both children and adults. The future inhabitants will have to make a monthly contribution to the VBV to help conserve the activities held. These contributions include becoming a member of the VBV and donating a certain amount of money. This money can consequently be invested in the neighbourhood in for example the maintenance of the communal gardens and kitchen garden.

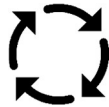
Within the VBV, an organization can be created that promotes the sharing of rental cars. Apart from saving money for the inhabitants and a reduction of CO2 emissions, it also creates a car free neighbourhood.



Figure 4.14 Reference image of a workshop. (urban design, 2017)

In the developing process of the neighbourhood, it is important to include the future inhabitants by forming working groups and getting them involved where possible. This is the only way to give people a sense of feeling to their future neighbourhood. Participatory workshops with potential inhabitants are needed to identify their needs and the potential for support in creating an eco-neighbourhood can be defined. The neighbourhood has the social class as target group. This means that a participatory concept should be created that generates a cost-effective approach and can therefore have an added-value, while creating awareness to internal and external stakeholders.

#### 4.3.6 Process



Each theme is perceived as a separate profession that operate as an integrated whole.

1

Before starting to plan the developments of the eco-neighbourhood, it is important to identify the eco-neighbourhood support within the province of Zeeland and consequently the city of Goes. An eco-neighbourhood goes further than just being a neighbourhood with some extra green space in it. It requires a certain perspective of inhabitants and demands a participatory approach. That is why a study is necessary to the demand of eco-neighbourhoods in Zeeland. Now, there are no real existing eco-neighbourhoods in Zeeland and this might add opportunities to the one in Goes-Oost. If there is enough support and there are enough relevant positive reactions, the next phase can begin. If there is not enough support, another process step must start to identify the options that can be considered so the new neighbourhood will still become as sustainable as possible.

2

The second step is about identifying the added value to the different stakeholders that are going to be operating in this neighbourhood. The most important stakeholder will be RWS Partner in Wonen. This stakeholder must be convinced by creating a positive business plan that generates an added value for the firm as well as generating added value for the future inhabitants since they are operating in the social class. Also, to fulfil long-term demands it is essential to include the water firm Videns and energy firm Delta.

3

When the first potential inhabitants have applied to take part in the project, it is important to start the participatory process immediately. Future inhabitants will be split up over the different themes that have been defined and will each get a professional to guide them. Clear boundaries are needed to make sure unrealistic plans are avoided. Also, guided trips to previously implemented eco-neighbourhood can be of great value to the workshops. By involving potential inhabitants in the development of the Verzetsheldenbuurt, social cohesion between these people is already occurring and gives the people a desired sense of community.

In the vision for the Verzetsheldenbuurt, several ideal scenarios are elaborated that might seem suitable. The options are explained per theme and these options have different dynamics for different locations. Complete self-sufficiency is not the best solution in the Verzetsheldenbuurt, but self-sufficiency on some of the themes might be suitable when looking at the long-term. Energy and water are the most important themes and space is left in the neighbourhood for these themes to develop themselves. Further research to the specific measures mentioned in this research might serve useful. For example, research to the implementation of a vertical helophyte filter can make the neighbourhood more self-sufficient on the water grid. The vision per theme has come together in an integrated and holistic way in the spatial concept, where three scenarios have been developed that are all in balance with the vision.

## 4.4 Spatial concept

During the design process, many sketches were created to develop the most suitable scenarios for the Verzetsheldenbuurt (Appendix 6). The scenarios had to fulfil the criteria that were defined in the vision. Bigger views of the scenarios can be seen in appendix 8.

### 4.4.1 Scenario 1



Figure 4.15 Scenario 1 for the Verzetsheldenbuurt (Author, 2017).

The first spatial concept can be defined as an ideal scenario that has its focus on creating a neighbourhood that connects all houses with each other through an unimpeded public green area. Another focus of this scenario is about orienting new houses as much as possible to the south and results therefore in optimal energy collection through solar energy. The existing infrastructure has been abandoned completely and results in a new road system that encloses the whole neighbourhood. By applying this strategy, it is possible to orientate all the buildings to the south. Nearly all parking lots have been condensed to the northern border since most traffic noise comes from this area. Also, this street includes the biggest buildings and parking lots wouldn't damage the public quality. This concept has divided the neighbourhood in seven zones. Six separate residential zones form different communal gardens, part of the foundation (VBV). The two apartments north and south form the closure of the seventh zone: the communal kitchen garden and two wadis. The large communal garden will also get edible vegetation where possible to stimulate the level of permaculture.

40 apartments
42 small family houses
36 life-cycle houses

This concept includes two apartment blocks of both 20 apartments. Furthermore, the right side now consists of 42 small family houses and the left side consists 36 life-cycle houses. This is only a scenario and a combination between these two types can be created to further enhance the social cohesion in the neighbourhood. The apartments will get green roofs together with solar panels oriented to the south. The green roofs can also function as a communal garden for the residents of the apartments where they can harvest crops or relax on their roof. Above water-drainage in the form of fluted gutters along the streets and the collection of water from rooftops will together form the main flow of water towards the wadi's. The wadi's will be the lowest part of the neighbourhood where all water comes together. The water can infiltrate or can be reused in the kitchen garden. To extend the availability of parking lots, the sides of the roads in the south are an option, since some space is left open. The six building zones can become phases in the building process where a level of success can be identified. The highest level of self-sufficiency is acquired.



#### 4.4.2 Scenario 2



- ✓ Vivid flow of houses
- ✓ High housing density
- ✓ High parking norm
- ✓ Expanding southern green border with street
- ✓ Diminishes noise from northern border



- × Costly
- × Communal green space hard to maintain
- × Complicated infrastructure
- × Some gardens facing north

Figure 4.16 Scenario 2 for the Verzetsheldenbuurt (Author, 2017).

The second spatial concept has its focus on creating the most dynamic neighbourhood in terms of housing location and diversity. The existing infrastructure has been completely abandoned. Inhabitants in this neighbourhood will experience a vivid, diverse and water oriented surface, where the communal garden is a stretched-out area rather than a circled area. The neighbourhood and its buildings are formed around a curved wadi, which is a low-lying water body where all above-water drainage systems end. In the stretched area, the communal kitchen garden is still present, though it is not in the middle. This scenario generates a high-water capacity and makes for a successful option in its level of self-sufficiency.

40 apartments
42 small family houses
30 life-cycle houses

However, this neighbourhood decreases the possibilities to have successful social cohesion. Two courtyards are separated from the rest and form the semi-private areas. Each of the corners form a parking lot and this generates a high parking norm. Approximately 130 parking lots have been measured in this scenario, which is the highest from all scenarios. This is necessary due to the high amount of houses this scenario gets. The northern border with the s' Heer Elsdorppweg is closed by placing houses with their gardens facing south. This diminishes noise from traffic within the neighbourhood.

This concept includes two apartment blocks of both 20 apartments. Then, 42 small family houses are divided over the area to increase social cohesion. The other 36 life-cycle houses are divided over the area. The orientation of the houses is both to the south and west/east. This means some of the energy will be lost when applying slanting rooftops to the houses. An option to tackle this is to make the roofs of the eastern and western houses flat. Using this technique, solar panels can be placed on the flat rooftops. Also, trees can be placed at the sides of the houses to become natural blinds.

This neighbourhood is positive on nearly all themes apart from finance, energy and participation. The energy system will become complicated due to the unstructured location of buildings. Social cohesion in this neighbourhood is tricky since the semi-private areas have no structure.



#### 4.4.3 Scenario 3



Figure 4.17 Scenario 3 for the Verzetsheldenbuurt (Author, 2017).



- ✓ Four structured semi-private green areas
- ✓ High level of social cohesion
- ✓ Good combination between urban and green areas
- ✓ Clear water system
- ✓ Realistic in terms of cost-effectiveness
- ✓ Phasing opportunities



- × Costly
- × Some houses disconnected from green area
- × Some house gardens facing north
- × Low housing density

The first two spatial concepts showed scenarios where the underlying infrastructure was of no importance and the buildings were placed freely. However, this scenario shows the most realistic spatial concept by taking the existing infrastructure as a basis. The focus lies on the creation of smaller semi-private gardens that can be maintained and owned by the inhabitants.

20 apartments
28 small family houses
48 life-cycle houses

This concept consists of five communal zones: The first four zones consist of semi-private public areas where social cohesion can exist on a small-scale. Inhabitants become owner of these smaller areas. An option is to give each of these areas a different theme. For example, zone A could get fruit as edible vegetation and zone B could get vegetables as edible vegetation. This can then be exchanged in zone 5, where the communal kitchen garden is located. This area can be a meeting place for pleasure or can serve as an exchange place of materials. The zones are divided by the above-water drainage ditches where small bridges make the connection with the whole neighbourhood. This splits up the semi-private areas and increases the quality and appearance of the neighbourhood.

20 apartments at the northern border of the neighbourhood serve as a noise buffer. Also, it adds up to the dynamics of the s' Heer Elsdorppweg, being large buildings. Then, 28 small family houses and 48 life-cycle houses form the rest of the spatial concept. The construction as it is now, is a dynamic one and the types of the houses can be changed where necessary. Different types of houses can increase the amount since life-cycle houses take up more space. The southern border with the Kamperfoeliestraat has great quality because it is the only street with public green space. This concept tries to maintain this quality by leaving an opening, which results in a flow of green into the neighbourhood. By applying this gap, long-term developments for the rest of Goes-Oost are incorporated. A connection between the whole area can be created. Phasing opportunities arise in the demolishing period due to the structured way of building. This spatial concept is most relevant to the vision since it incorporates all different themes in an integrated way.

## 4.5 Financial feasibility

When developing an eco-neighbourhood for the social class, the importance of financial feasibility is high. This neighbourhood inevitably generates extra investments that need solving. To roughly determine the additional costs and benefits of the Verzetsheldenbuurt and to determine its financial feasibility, a cost-benefit analysis and strategy has been developed. (appendix 7) The financial strategy has been based on case study research and the internal databases of Marsaki (Appendix 7) (Marsaki, 2017).

Building a neighbourhood involves several normal costs that won't be affected. Normal superstructure costs and land use costs form the basis of the cost-benefit analysis. The average extra costs when making a house NOM (Nul op de meter) is €23000 and this will be covered by the added EPV (energieprestatie vergoeding) (Appendix 7.1).

On a neighbourhood scale, a general cost-benefit analysis shows the normal costs and procedures done. Also, the additional costs are shown. These are the costs normally excluded when building a normal neighbourhood. These costs include a wadi, greenhouse, above-water drainage system (often cheaper than a normal drainage system), public greenery, kitchen garden. If an external source is used, it is mentioned (Marsaki, 2017). The main results of this table are the additional costs to build an eco-neighbourhood. These costs were then divided by the average number of houses present in the eco-neighbourhood (100). This results in the average additional investments needed per house. To tackle this issue, opportunities rise. Appendix 7.2 shows a financial analysis of the average additional costs that must be included to balance the additional investments of the eco-neighbourhood. It shows that an addition of €27,00 per month per house is needed to balance the investments. The additional investment will then be recovered in 25 years. Another opportunity to balance the extra investments are to research and sign up for more subsidies. These benefits could decrease the buildings costs in the starting phase (Marsaki, 2017). The foundation of the Verzetsheldenbuurt forms the main financial body through the neighbourhood and this is what the inhabitants will deal with the most. The foundation will generate several benefits, mostly coming from the contribution of the inhabitants. The benefits are split up in collective and individual benefits. Collective benefits are the ones achieved by using materials, taking off insurances, producing collectively, all together instead of doing it individual. This will be possible due to the high social cohesion the eco-neighbourhood generates. By doing these things collectively, it will save money and will produce benefits for the foundation (appendix 7.3).

Inhabitants benefit from living in the neighbourhood and to maintain this added value, they will have to pay a certain amount of money to balance the foundation's costs. The main benefit the inhabitants have is the disconnection from the main energy and water grid. Also, subsidies on individual buildings are added to their benefits. These benefits have costs on the other side. The costs for the inhabitants will be an increase in rent (Marsaki, 2017). The benefits from the disconnection of the grid can partly be reinvested in the contribution to the foundation. This will generate a certain amount for the foundation to invest in the quality of the area. These costs for the foundation are new investments in sustainability for the neighbourhood. The long-term vision can then be accomplished. Also, investments in education can raise awareness. This financial strategy adds value to RWS since inhabitants can pay rent easier since they are disconnected from the grid. This strategy is only an option and does not provide specific numbers and figures. Further research to the specific measures that could help the Verzetsheldenbuurt is necessary to determine its official financial feasibility.

A financial strategy does not only include numbers of money. When creating an eco-neighbourhood social benefits are of high importance. The activities included in an eco-neighbourhood have a favourable effect on the people and place and not all benefits can be quantified by numbers. For example, in the Verzetsheldenbuurt, quality of life will be higher than a normal neighbourhood and a high social value occurs. These unidentifiable benefits are included as social benefits.

To conclude this chapter, an overview is created that shows the financial feasibility of an inhabitant who is going to live in the Verzetsheldenbuurt.

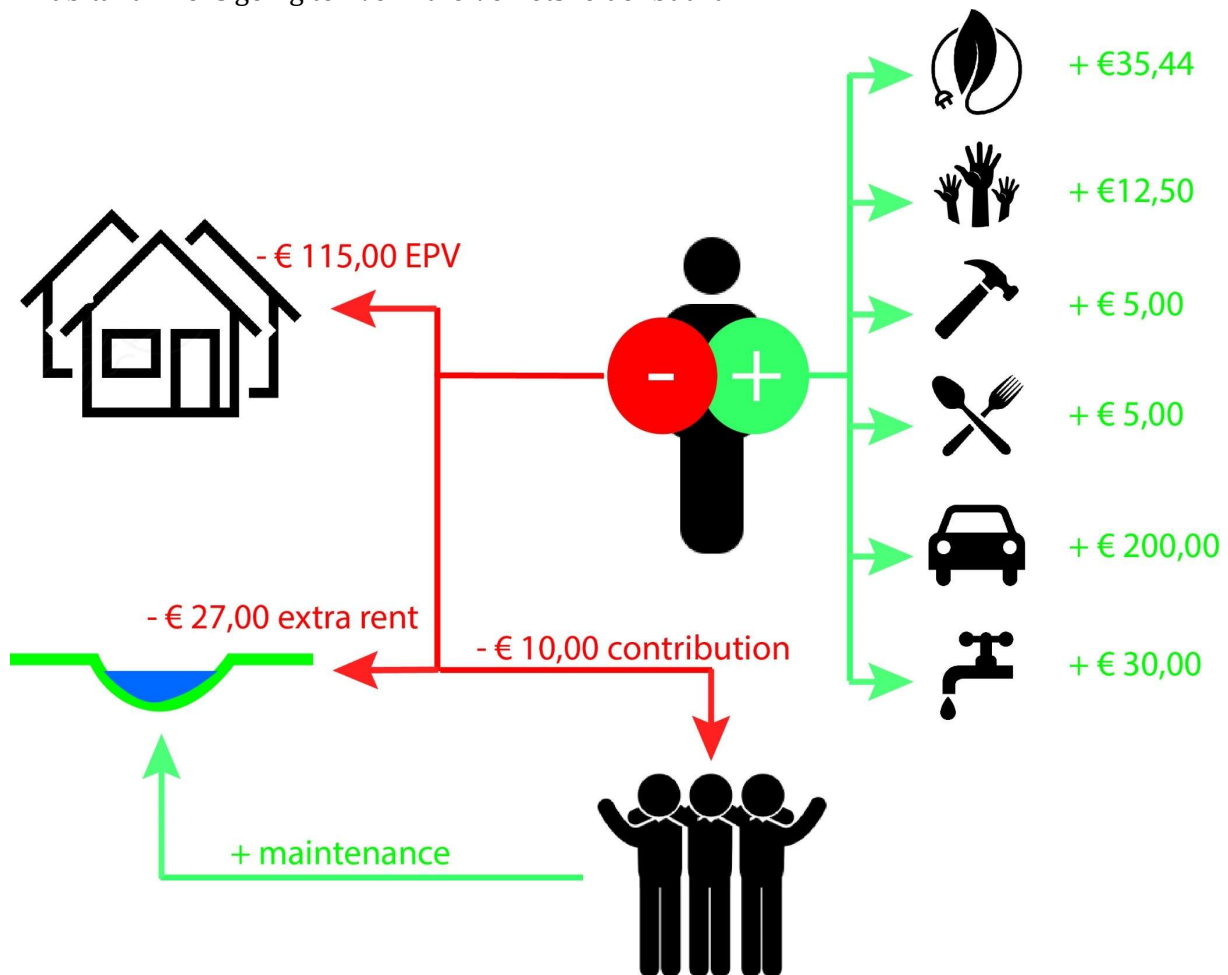


Figure 4.18 The inflows and outflows of the additional costs in the neighbourhood (Author, 2017).

A financial analysis has shown an eco-neighbourhood not to be a 'financial nightmare'. It can be questioned if the neighbourhood will still be suitable when a higher level of self-sufficiency is acquired. The foundation serves to cover the maintenance of the neighbourhood without causing too many additional costs. This decreases the overall pressure on the overall costs. This research has identified all possibilities and opportunities to create an eco-neighbourhood in the Verzetsheldenbuurt, becoming as self-sufficient as possible. The identified themes that are of relevance were water, energy, urbanism, environment, participation, finance and process. These themes all have specific building blocks and together form an integrated process. The vision for the Verzetsheldenbuurt has been visualised by three different spatial concepts, that all use the same tools defined in the vision. To select the best option, all criteria were applied to the spatial concepts and the concept should stay as realistic as possible. Scenario 3 has proven itself to be the most suitable option, where the best combination of social cohesion, realism and self-sufficiency is achieved.







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## 5. Discussion

In the initial phase of this research, it became clear that a wide range of themes were involved when building an eco-neighbourhood. The book of Pötz & Bleuzé (2012) showed the importance of the different themes involved that all enforce each other. Each theme must work, otherwise an eco-neighbourhood can't become a success. That is why the decision had been made to take a broad look at the subject since there was a lack of integrated approaches to this subject. This discussion serves as a critical reflection of the results in the previous chapter.

During the research process a diverse range of case studies were found. These case studies were often neighbourhoods that were trying to be as ecologically sustainable as possible. The research has shown that it is hard to find case studies that use an integrated approach to all the subjects. The only famous example in this research that uses all subjects is the neighbourhood of EVA-Lanxmeer in Culemborg. This case study has been used extensively and forms the basis for the eco-neighbourhood catalogue themes. Accompanied by various interviews, the knowledge of the case studies was expanded. The case studies were further used to generate existing self-sufficiency measures that have proven to be successful. However, all the measures are site-specific and a general toolbox is missing. More case studies would have been useful to further analyse the self-sufficiency measurements.

Desk research to the development of eco-neighbourhoods has shown the lack of integrated approaches. This unintentionally led to the creation of a catalogue or toolbox that showed general measures per theme, to become self-sufficient where possible. Looking at the eco-neighbourhood catalogue, it is obvious that one theme is missing: law & policies. At the start of the research process, it had been defined but has been excluded from further research due to limitations in time. This theme however, is of importance for the vision and design creation in the Verzetsheldenbuurt and requires research. The eco-neighbourhood catalogue can serve as a general toolbox for Marsaki when looking at possibilities per theme. Also, it can be said that this eco-neighbourhood is not complete since not enough research was possible in the given time of the research. More case studies and desk research would have been useful to further complete the eco-neighbourhood catalogue.

An area analysis is done according to the principles of the study of Delta Management. During this analysis, the qualities and problems of the neighbourhood came forward. These findings have formed the basis for the vision and spatial concepts and have been fairly satisfying. However, some of the spatial context is missing.

In the research process a vision has been created for the pilot area: Verzetsheldenbuurt. This vision generates a neighbourhood that has both short-term and long-term measures to become as ecologically sustainable as possible. When creating the vision, the surroundings of the area have been considered by identifying the Genius Loci. The vision has been loosely based on the eco-neighbourhood catalogue and assumes the measures taken in other case studies, can be applied in the Verzetsheldenbuurt.

The resulting phase of this research was about translating the vision to a spatial concept. The decision was made to generate three spatial concepts that all derive from previous case studies and knowledge of the area. By doing interviews with Mr. Bleuzé (Appendix 6.1) and Mr. Zijlema (Appendix 6.2) the designs became more reliable. However, the design describes measures that need further research due to a certain complexity. For example, the vertical helophyte filter, described in the vision, requires better research. Also, the design is in a sketching phase and needs a detailed urban plan, landscape fitting analysis and a destination plan.



The validity of this research can be guaranteed because of the various research methods used. The case studies researched have proven to be useful in the research and the extensive amount of knowledge available on the case studies used increases the reliability. The prepared research methods described in chapter three were all used during the research process and all delivered valuable information for this research. The involvement of experts in the field of project management and sustainable developments contributed to the validity of the research. To make sure the results are objective, complete and correct, it was regularly checked and discussed by colleagues from Marsaki within Marsaki and the graduation supervisor. Time was a limiting factor in this research. More time would have been useful to integrate a more comprehensive and integrated catalogue by analysing more case studies. Also, international cooperation could have been useful.

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## 6. Conclusions & recommendations

Goes-Oost has been an underdeveloped and outdated neighbourhood for some time now and Marsaki was asked to be involved in the restructuring process of one of the neighbourhoods: the Verzetsheldenbuurt. The paradigm shift to sustainable development and the changing climate contribute to new law & policies that demand new housing developments to become NOM. To create a neighbourhood that shows a different and ecologically sustainable way of living, research had to be done to the opportunities to create such a neighbourhood. Therefore, the main question discussed in this research was: **What are the possibilities to make the neighbourhood in Goes-Oost self-sufficient by looking at the spatial, environmental, climate, social and financial aspects?**

### 6.1 Sub questions

**Sub question 1: How is self-sufficiency of an eco-neighbourhood defined when looking at the context of the research?**

An eco-neighbourhood is a neighbourhood where inhabitants meet their own needs, enhancing their well-being without damaging the natural world or endangering the living conditions in the future and being self-sufficient where possible, while using renewable energy. The term self-sufficiency is not only about energy or water self-sufficiency, but includes the integration of several themes. Self-sufficiency is mostly used as a number in energy supply (EPC, BENG), and does not follow a holistic and integrated approach towards sustainability and long-term implementations. This research is using the term self-sufficiency as followed: becoming as ecologically sustainable as possible, looking at economic, social, financial and ecological approach without damaging the quality of life for inhabitants and thus taking a holistic and integrated approach. Consequently, complete autarky is not an absolute requirement and a broader range of options have been analysed.

**Sub question 2: What are the most important themes to make an eco-neighbourhood and what are the most successful options based on previously implemented projects?**

By looking at six case studies, it became clear that creating an eco-neighbourhood is a result from the connection between a diverse range of integrated themes. To achieve the eco-neighbourhood goal, several themes are the basis that all cooperate in a holistic and integrated way using people, planet & profit as basis. The defined themes are urbanism, environment, water, energy, participation, finance and process. The most successful options of previously implemented projects have been implemented in an eco-neighbourhood catalogue (appendix 5) and formed the basis for the vision and spatial concept of the Verzetsheldenbuurt.

**Sub question 3: What are the possibilities to become self-sufficient concerning the environment and the climate?**

Case study research and interviews have shown that permaculture is the main concept that should be included in an eco-neighbourhood when looking at environmental integration. It offers opportunities to integrate urban agriculture as form of self-sufficiency. The climate has influence on the environment. To decrease pressure on the environment, an interwoven energy and water system is needed. To improve the climate's quality, measures must be taken that result in the disconnection of the water and energy grid. Disconnection from the water grid requires a lot of space, which is not completely suitable in the project area. However, partial self-sufficiency on water is possible by collecting rain water, filtrating it through wadis, and reusing it where possible. This form of water drainage decreases the pressure on the main water drainage system.

By disconnecting the grids, the environment of both the project area and surroundings will be enhanced.

**Sub question 4: How can participation and social cohesion contribute when creating a self-sufficient neighbourhood?**

Participation is the most vital theme to create an eco-neighbourhood. This is also the theme most project developers are likely to neglect since a top-down approach is often the easiest procedure. In the developing process of an eco-neighbourhood, it is important to include the future inhabitants by forming working groups and getting them involved where possible. This is the only way to give people a sense of feeling to their future neighbourhood. Participatory workshops with potential inhabitants are needed to identify their needs. Social cohesion will be a result from the participatory approach since potential inhabitants connect with each other and develop mutual interests.

**Sub question 5: What are the spatial and urban values of the neighbourhood and how can they be maintained and improved while becoming self-sufficient?**

The project area, called the Verzetsheldenbuurt, distinguishes itself from being the transition zone between the urban centre of the city of Goes, and the rural area at the border of the city, connecting the villages, such as Kloetinge. This purpose has evolved since the Middle Ages and resulted in the creation of a post-war neighbourhood. The area identifies itself as the centre for education (primary and secondary schools for various religions and levels) and health care. To maintain the spatial qualities of the neighbourhood, these qualities must be included. Furthermore, to enhance the natural dynamics of the neighbourhood, a vivid integration of urban, natural and agricultural elements is created. These connections come back in three identified spatial concepts for the Verzetsheldenbuurt where all defined themes come back to increase the quality of life and to become as self-sufficient as possible.

**Sub question 6: What are the financial influences in making a self-sufficient neighbourhood?**

It is often said that making an eco-neighbourhood equals higher costs. However, a high range of advantages rise when this type of neighbourhood is developed. Subsidies form the top-down advantages that can be acquired on both the neighbourhood and inhabitant scale. By integrating high social cohesion and participation, additional costs can be avoided by cooperating in the neighbourhood collectively. A foundation can be set up to manage the maintenance and cooperation within the Verzetsheldenbuurt. The economic feasibility of the neighbourhood must be in balance to make a project realistic.

Not only the numerical benefits are present in a neighbourhood. Social benefits form the unidentifiable advantage of an eco-neighbourhood. Becoming sustainable within a social environment increases the quality of life and comfort for inhabitants in a neighbourhood. It might be possible that the social benefits for future inhabitants of an eco-neighbourhood outweigh the additional costs it brings.

## 6.2 Main question

Based on the defined themes (water, energy, urbanism, environment, participation, finance and process) an overview of possibilities and interventions to create an eco-neighbourhood has been made in the form of a catalogue. This research has proven that complete self-sufficiency requires a wide project area and extensive social interest and will decrease the comfort of inhabitants in an urban area. The vision for the Verzetsheldenbuurt included the most important possibilities to generate a partly self-sufficient neighbourhood and has been visualised by three different spatial concepts, that all use the same tools as defined in the vision. To select the best option, all criteria were applied to the spatial concepts and the concept should stay as economic feasible and realistic as possible. Scenario 3 has proven itself to be the most suitable option, where the best combination of social cohesion, realism and self-sufficiency is achieved.

## 6.3 Recommendations

The results discussion explained several limitations and recommendations for Marsaki to execute. This bachelor thesis can be continued by doing more in-depth research, to strengthen its outcomes and to integrate more disciplines and opportunities. Therefore, an overview of essential recommendations is developed for the continuation of this project.

### 6.3.1 Elaborate vision

A thorough vision was created for the Verzetsheldenbuurt and includes a few most important aspects per theme. The overall goal of the vision is to generate a neighbourhood that is ecologically and connects green and blue grids. When the neighbourhood is being developed, aspects from this vision can be included to enhance the overall sustainability of the neighbourhood.

### 6.3.2 Elaborate spatial concept

During this research, three spatial concepts were presented. These spatial concepts have been based on the area analysis of the Verzetsheldenbuurt and opportunities to become self-sufficient. Due to time limitations, some of the developments of the spatial concept have been left out and require more elaboration.

- A stakeholder analysis (appendix 2) has been created, including all stakeholders relevant to the Verzetsheldenbuurt. A communication plan must be created that includes how each stakeholder can be involved when building an eco-neighbourhood and how to address them. By creating this communication plan, more goodwill to the plan will be generated.
- The vertical helophyte filter is a measurement often described, but has been excluded since it accompanies high complexity. It is however recommended to do an analysis on the possibilities to implement a vertical helophyte filter, so the grey water can be disconnected from the main water grid.
- The area analysis missed some important analyses due to time limitations. A research must be done to the archaeological value of the neighbourhood and whether this has further influence on the project.

### 6.3.3 Expand eco-neighbourhood catalogue

The presented eco-neighbourhood catalogue was a key product in the investigation process of the research. This catalogue is applicable on multiple locations and serves as a general toolbox of measures. However, this catalogue is never complete and each theme has multiple options that haven't been examined yet due to the limitations in time.

- Further development of the eco-neighbourhood catalogue in every theme to identify all possible measures is needed. This is possible by analysing more existing eco-neighbourhoods.



- The inclusion of the law & policies theme to complete the eco-neighbourhood catalogue and making it more reliable.
- The continuation of updating the eco-neighbourhood catalogue needs to occur due to expanding innovations and the rising agenda of climate change and its urgency. The catalogue must be updated regularly with new information and measurements.

#### 6.3.4 Further research

Further research is necessary in several aspects before a true conclusion or recommendation can be formulated.

- The limited time available for this research did not provide the possibility to determine the economic feasibility of an eco-neighbourhood as specific as possible. That is why further research to the exact numbers of certain measures must be done to determine the exact economic feasibility of the spatial concepts defined, in the Verzetsheldenbuurt specifically.
- This research assumed the demand for an eco-neighbourhood would be high since not much developments have happened yet, but an exact analysis must be done. Further research is necessary to analyse the demand of an eco-neighbourhood within Zeeland and the potential inhabitants can be identified in this research.
- This research showed that becoming self-sufficient on energy level is not yet possible. However, innovations are always occurring and therefore further research is necessary to analyse more options in the energy theme.





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*'You are the last best hope of Earth. We ask you to protect it or we, and all living things we cherish, are history.'*

- Leonardo DiCaprio

# Appendices

## Appendix 1 ‘Area analysis’

In this chapter, the specific area is going to be researched, analysed and processed and the most important data will be summarised and conclusions will be made. In an area analysis, it is important to describe the area as detailed as possible without losing sight of the main purpose. The specific characteristics of the project area are described in this chapter and elaborated as much as possible.

### Project area

First, it is important to identify and describe the specific project area. As can be seen on the map on this page, the project area is in the province of Zeeland, the Netherlands. Zeeland is a province surrounded by a lot of water. Zeeland is susceptible to the impacts of the changing climate and in the past a lot of developments have been executed to deal with it such as the storm surge barrier. (Rijkswaterstaat, 2016)



Figure 1 The location of Goes within Zeeland.

Goes is the specific city of the project area. Goes is a vivid city and is in the centre of the province of Zeeland, as can be seen in figure 20. Goes functions as the centre for the surrounding villages in Zeeland and accommodates many companies, schools and other facilities. Goes itself is separated in several districts, the northern/western/southern and eastern district. The project area is in the Eastern district of Goes, as can be seen in the figure.



Figure 2 The first figure shows Zeeland and the second figure shows Goes. Retrieved from Google Maps.

The first area that was built in this neighbourhood was the ‘Bloemenbuurt’ in the 30s. It was very popular among the inhabitants of Goes. After that, a new villa neighbourhood was built next to the Bloemenbuurt and a big area of residential care complexes and the new neighbourhood with a lot of apartments and a lot of terraced houses. The specific buildings in the project area were built in 1948 and are therefore outdated. This comes forth from the ‘Basisregistratie Adressen en Gebouwen (BAG)’. The neighbourhood is called the ‘Verzetsheldenbuurt’ and lies near the city centre.





Figure 3 The specific project area.

It is also close to the rural area of Zeeland and has therefore a good spot because it lies within an urban area but also has the calm ambiance of the rural area. This is a neighbourhood that has a northern border with the street name 's'Heer Elsdorppweg', a western border with the name 'de Koninginneweg', an eastern border with the houses at the 'M.D. de Grootstraat' and a southern border with the 'Kamperfoeliestraat'. Figure 22 shows the exact location and shows that a few houses south of the Kamperfoeliestraat are involved,

because it is property of the corporation RWS. The project area has been measured and the total area to be restructured is roughly 40000 m<sup>2</sup>. (4 ha)

## History

To fully understand the history of the specific neighbourhood, it is important to look at the broad history of Goes and all its important developments. Goes originates from the 10<sup>th</sup> century at the edge of a small creek: 'Korte Gos'. (Gemeente Goes, 2016) The first houses were built on the creek ridge and in the 12<sup>th</sup> century the first city square was already in place. This led to the building of the first church, devoted to Maria Magdalena.

In 1407, the first signs were there that the village grew from a small town, to a city. City walls were built and a steady workflow was created around the city. The main source of wealth came from the winning of salt. (Gemeente Goes, 2017) This material came from the French coast. Furthermore, the textile industry was an important source of income in the rising city, which also had a purpose of laying central in Zeeland. The 16<sup>th</sup> century stands for economic growth in Goes. Despite a lot of floods and fires, they built houses of stone and continued the growth. In the following centuries Goes remained a steady and small agricultural city on the isle of Zuid-Beveland and endured despite the problems as is mentioned before.

Until the 19<sup>th</sup> century, Goes remained a small trading city, mainly surrounded by agriculture. In 1868, the first train rail was created but this still didn't lead to expansion and industrialization of the city. A lot of the trend of industrialization passed the province of Zeeland and didn't reach goes at all. It didn't reach the city until 1918, when Goes started to rise being a city of services to the rest of Zeeland. The big flood of 1953, that flooded nearly all of Zeeland, didn't reach Goes since its altitude lies a little bit higher. (Gemeente Goes, 2017) After the big flood in the eighties and nineties, the city finally grew to become an industrial centre in Zeeland.

To summarise, the rise of Goes came in place because of the wealth in salt and textile trade. During wars and floods, Goes endured and continued developing to become a vivid centre of Zeeland in service and industry.



Figure 4 A historical map from 1750 showing the Eastern part of Goes. *Ongeldige bron opgegeven.*

The cultural history of the neighbourhood is important since the Genius Loci is highly valued, which has been explained previously. Figure 23 shows a historical map from 1750 retrieved from Geoloket Zeeland. This map shows that the s' Heer Elsdorp weg has always been the infrastructural connection between the urban and rural area. The cultural historical land-use was primarily focused on agriculture with the main road being the Rafaelje Weg. The neighbourhood's main identity revolves around the strong integration of education, schools and religious diversity.

## Layer-analysis

The layer-analysis will be executed in the following paragraph, according to the 'The Dutch Layers Approach to Spatial Planning and Design'. (Jeroen van Schaick, 2016) This includes the procedure to look at three most important layers in an area: the substratum (soil, water, energy), network (infrastructure and public space) and the occupation layer.

## Substratum layer

The substratum layer consists of the soil, water and energy layer.

## Soil

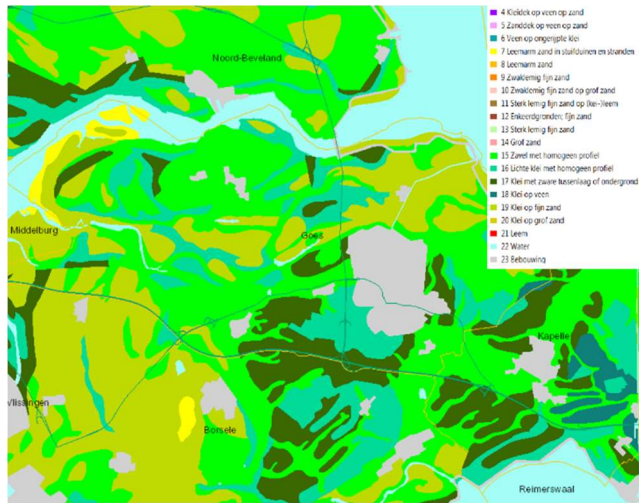


Figure 5 The physical geography map of the province of Zeeland. *Ongeldige bron opgegeven.*

The soil of the project area consists mostly of sulphur-containing homogenous soil. This is because the whole of the province of Zeeland is part of the South-Western Delta and its sediment deposit is mostly marine clay and sand. (see figure 24) The red circle shows the location of Goes. The area characterizes itself by an open landscape and often accompanies large-scale agriculture. Also, this soil type often has slight differences in altitude and has deposits of sand because of the creation of the marine clay. The soil in Goes is highly fertile and brings a lot of opportunities.

(Wesselingh, 2017)

## Water

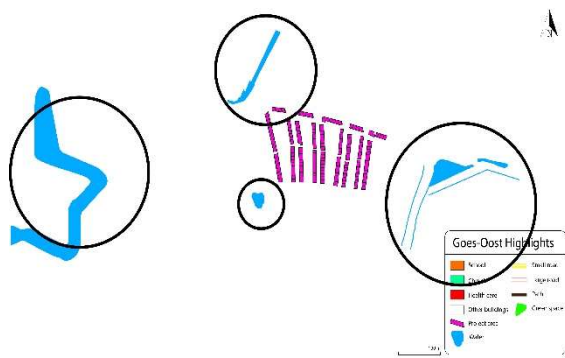


Figure 6 The surface water present in Goes-Oost (Author, 2017)

Zooming in on Goes-Oost, figure 25 shows the lack of surface water. The flow of surface water goes around the Verzetsheldenbuurt and the first bigger body of water is found in the city centre of Goes, dating back to the creation of the city. The most nearby bigger waterbody is the Havenkanaal that flows to the Veerse Meer. Figure 25 shows the attraction circle of the waterbodies and reveals that the Verzetsheldenbuurt has no valued water.



Figure 7 Water in the project area.



Figure 8 Water in the project area.



## Height

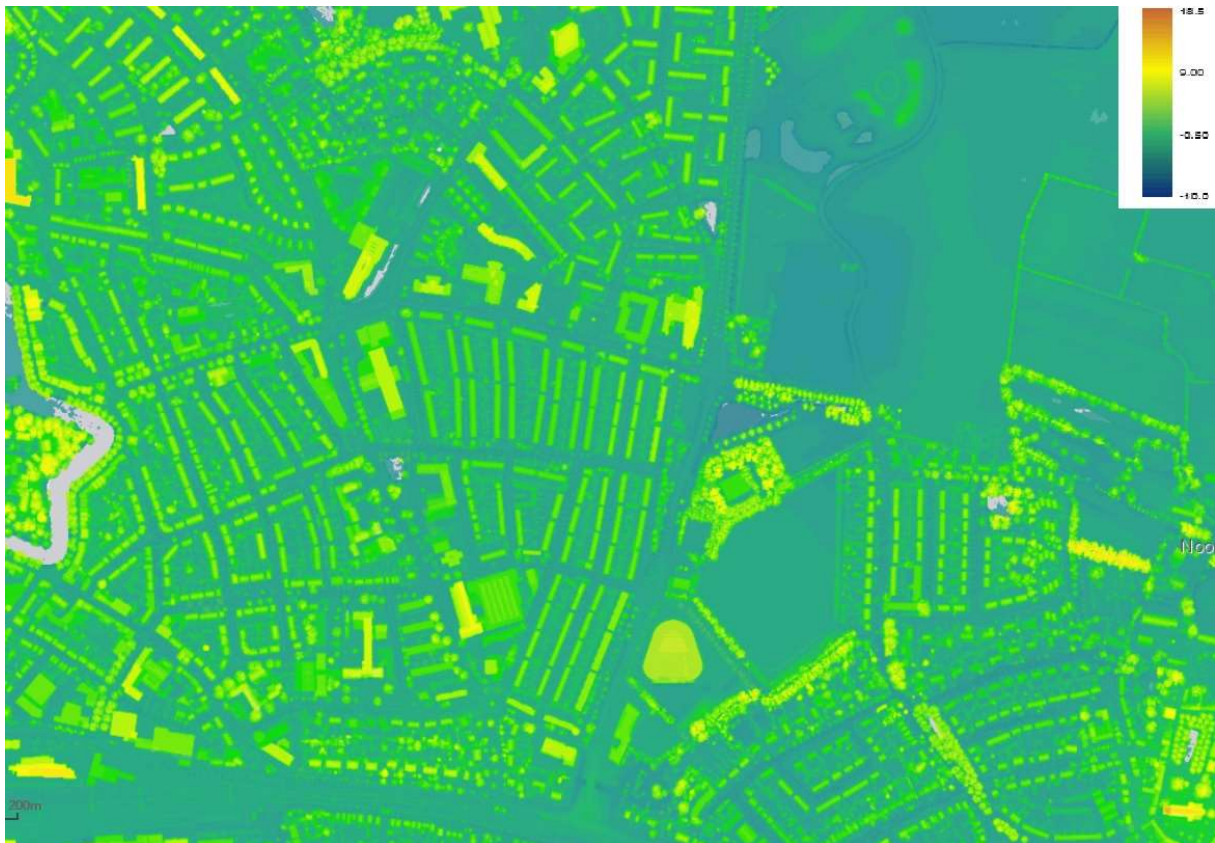


Figure 9 Height map of Goes-Oost (AHN, 2017)

Figure 26 shows the current height map of Goes-Oost and reveals that the Verzetsheldenbuurt is built on an average ground level height. The highest locations are formed towards the city centre, revealing the old fortress of Goes. The lowest lying areas are located at the eastern border of the project area. The water pond forms the lowest lying area, being connected to the agricultural hinterland. The Verzetsheldenbuurt itself offers no lower lying body that offers opportunities for the creation of a natural water pond. On the other hand, the highly-paved area and the existing water pond create opportunities for the disconnection of the water system in the new neighbourhood in the form of water storage, purification and re-use. To be concluded, the height map offers no restrictions of opportunities of great value to the new neighbourhood.



## Network layer

The network layer consists of the infrastructure and public space layer.

### Infrastructure



Figure 10 Infrastructure of Goes-Oost (Author, 2017)

Figure 27 shows the infrastructure of the northern part of Goes-Oost. The red road shows the most important access road through the neighbourhood and forms the connection between the city centre and the outer border of the city. The s' Heer Elsdorppweg as it is called, is also the busiest road going through the neighbourhood, and provides the most noise for nearby houses. The infrastructure of the project area is simple by having five major streets running through, connecting the building clusters to the main road. The existing roads are badly constructed and there is a lack of parking lots and biking paths. The backyards are mostly connected by small walking paths, which are a 'brandgang' in Dutch. The roads have been renovated recently to solve the parking problem. However, during this process there was a lack of thought about the quality of life and inclusion of public green space. That is why the infrastructure still needs improvement.



Figure 7 The recently renovated Jacob Klaaijsenstraat



Figure 8 A 'brandgang' connecting the private gardens

## Public space

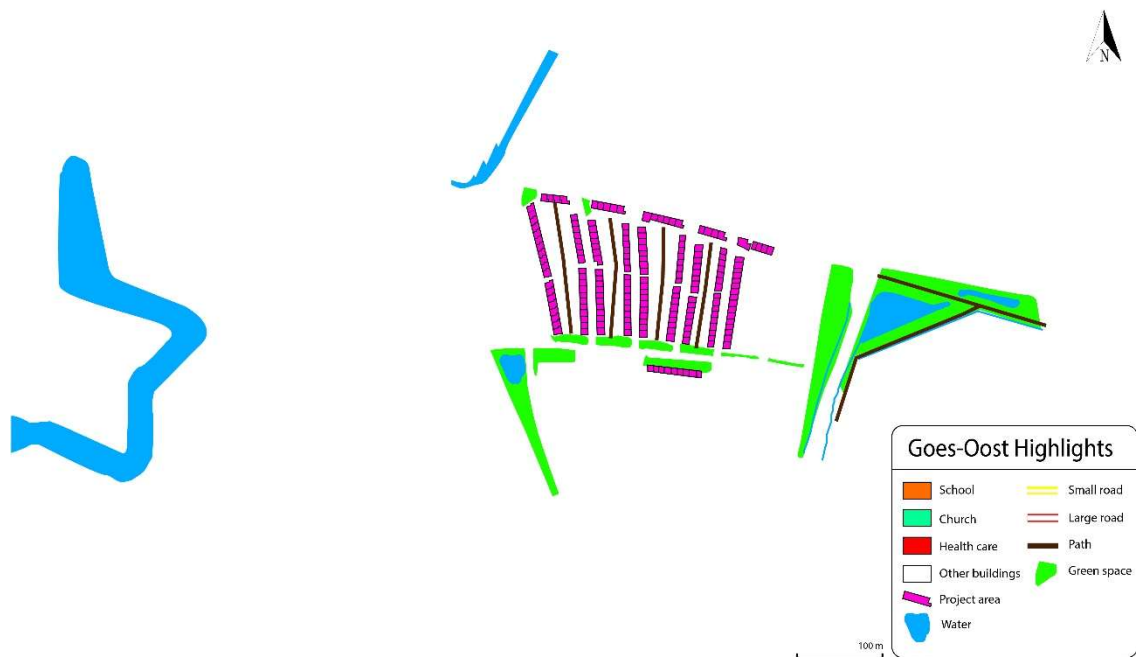


Figure 9 The public green space in and around the project area, including the surface water (Author, 2017)

Figure 30 shows the public green space of the northern part of Goes-Oost. It immediately stands out that there is a lack of public green inside the project area. The only public green strokes present can be found at the southern border of the project area, attached to the 'Kamperfoeliestraat'. The natural green in the Kamperfoeliestraat consists of grass land and a diverse range of tree types. However, the houses standing next to this green space are facing the eastwards and have no view over the green area as can be seen in figure 30. The eastern border of the project area has a small playground, attached to the Graaffstraat. The project area itself has no green space included apart from a few trees. This lack of public green leads to a decrease in quality of life. Furthermore, there is a loss of orientation when walking through the area due to an overuse of paved area. Eastern of the Oranjeweg, there is a small pond surrounded by a public green area. A small hiking path offers a tour around the pond.



Figure 12 The Kamperfoeliestraat and its public green



Figure 13 A small playground and the De Graaffstraat.



## Occupation layer

The occupation layer consists of the property and facilities layer.

## Housing property



Figure 14 A map showing the housing property of the project area, (Author, 2017)

At this moment, the area consists of 138 social rent houses divided over five streets. As can be seen in figure 33, the property of the owners has been split up into two parts: private ownership and corporation ownership. It will be hard to include the housing clusters in the project that include private property. Especially the Koninginneweg has a lot of private houses and it can be questioned whether they should be included in the project plan.



Figure 15 Private foodstore owner at the Kamperfoeliestraat (Maros Slagerij)



Figure 16 Private foodstore at the Kamperfoeliestraat (Vietnamese)

## Facilities

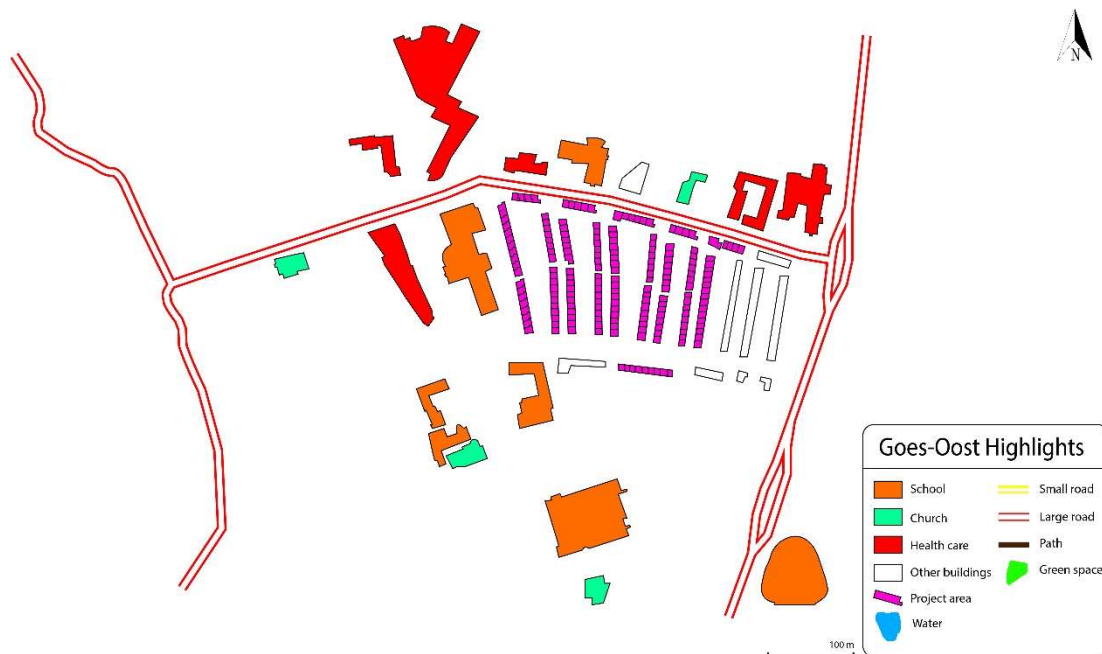


Figure 17 A map showing the different types of facilities in the project area. (Author, 2017)

The project area that is going to be restructured has no facilities itself since there is not enough space. Goes-Oost however, has a lot of good facilities that enhance the quality of the complete neighbourhood. First, Goes-Oost offers a broad range of schools. There are two secondary schools present that go by the name 'het Goese Lyceum' and 'Ostrea Lyceum'. 'het Goese Lyceum' is a recently built school at the border of the neighbourhood as can be seen in the figure below. Furthermore, there are numerous residential care areas with a big one that stands out 'Zorgcentrum Randhof'. This residential care centre also offers home care in the whole neighbourhood of Goes-Oost. Furthermore, there are primary schools located in the neighbourhood called 'Basisschool Prinses Ireneschool'. Lastly, the neighbourhood has its own community centre, which organises a lot of social evenings in the form of bingos, playing bridge and having billiard evenings. All these facilities are on walking distance from the project area and are therefore relevant. As can be seen in figure 14, the project area is surrounded by the previously mentioned facilities. This brings a lot of opportunities and can be a pillar to build on in the project plan. The only thing the neighbourhood lacks is a nearby supermarket.



Figure 18 The newly built Goese Lyceum, located at the Oranjeweg.



Figure 19 One of the primary schools present.



## Social-demographic

The choice has been made to look at the social-demographics with a broad perspective taking into account the whole of Goes-Oost and also analysing the surroundings of the Verzetsheldenbuurt. Not only the social aspects are shown, but also the energy use of natural gas per household to show the level of sustainability now. The data has been acquired from Central Bureau for Statistics. (CBS, CBS, 2016)

Inhabitants: gender (CBS, 2016)			
	Number of inhabitants	Gender	
		Men	Women
Area	number	number	
Goes (municipality)	37.207	18.252	18.955
Goes (city)	27.390	13.315	14.070
Goes-Oost	5.955	2.775	3.180

Table 1 Inhabitants based on gender.

	Number of inhabitants	Age groups				
		0 - 15 year	15 - 25 year	25 - 45 year	45 - 65 year	65 years and older
Area	number					
Goes (municipality)	37.207	5.549	4.054	8.444	10.879	8.281
Goes (city)	27.390	4.005	2.970	6.440	7.645	6.330
Goes-Oost	5.955	820	535	1.275	1.480	1.850

Table 2

Income of the population (CBS, 2015)				
		Income of persons		
	Number of inhabitants	Number of persons with income	Average income per person with income	Average income per person
Area	aantal	aantal	x 1.000 euro	
Netherlands	16.900.726	12.907.400	30,0	23,4
Goes (municipality)	37.153	28.800	29,6	23,8
Goes (city)	27.300	21.200	28,9	23,4
Goes-Oost	6.015	4.600	28,0	22,8

Table 3

Energy: natural gas per property (CBS, 2015)			
	Average use of natural gas		
	Average use of natural gas	To property	
		Rental house	Private house
<b>Area</b>	m <sup>3</sup>	m <sup>3</sup>	
<b>Netherlands</b>	1.250	1.030	1.480
<b>Goes (municipality)</b>	1.240	1.040	1.420
<b>Goes (city)</b>	1.150	1.030	1.360
<b>Goes-Oost</b>	1.300	1.090	1.530

Table 4

As can be seen in table 1, there is an average division between men and women in Goes-Oost with a slight advantage to women. This is however no change to the national and municipality average and shows no difference. Table 2 shows the age groups in the neighbourhood and reveals that the amount of people that are 65 years and older is higher than average compared to the whole of Goes. The cause for this is likely to be the high amount of health care centre in the neighbourhood. Also, the number of students is very low and shows that the families living in Goes-Oost have young children with the age of 0-15 years.

Table 3 shows the income of the population of the Netherlands, Goes and Goes-Oost. This table reveals a slightly lower income for the people in Goes-Oost. It can be said that Goes-Oost is one of the poorer neighbourhoods in Goes and this comes back in the average income and adds up to the condition of the buildings and houses.

Table 4 shows the energy use in the form of natural gas per property. This table reveals that the use of this fossil fuel is slightly higher than other neighbourhoods. Also, the comparison to the average rate in the Netherlands shows a slight difference. This raises the importance of an improvement of sustainability in the neighbourhood and shows the relevance of this project.

## Conclusion



Figure 20 A complete map of the project area, including all previously explained layers. (Author, 2017)

- Now, the neighbourhood doesn't have enough 'air'. The buildings follow each other closely and there is nearly no space in-between them. The only street that is wider and includes small strokes of green space, is the 'Kamperfoeliestraat'. The houses are mostly standing sideways to these green spaces, and therefore the area is not optimally used and experienced. The neighbourhood mostly consists of stone and nearly no green space is integrated. Furthermore, there is no water in the neighbourhood and this adds up to the decrease in quality of life.
- There is no supermarket available in the area, but has a lot of other facilities such as schools and health care centres and this gives the neighbourhood great value.
- The project area has a one-sided structure of housing types, being small social rent houses.
- The clusters of houses are too long and narrow.
- The orientation of the houses is not favourable since they have the wrong position to the sun.
- The houses have deep private gardens and right now, the inhabitants are very satisfied with this.
- There are no real signs of any significant archaeological values that are of importance to the realization of a new project area.
- The Genius Loci manifests itself mostly to a post-war character with structured housing and integration of education, health and religion with a great diversity in ethical background. Also, the neighbourhood distinguishes itself from being the transition zone from urban to rural area.
- The social-demographic tables show that Goes-Oost is a neighbourhood that is slightly poorer than the average rate in the Netherlands and municipality of Goes.
- The average use of natural gas per property is slightly higher than the average in the Netherlands and raises the importance of an ecologically sustainable neighbourhood.

The results of the analyses will be incorporated into a SWOT-analysis, where the most important Strengths, Weaknesses, Opportunities and Threats will rise.



## Visual conclusion



(Author, 2017)

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## Appendix 2 ‘Stakeholder analysis’

The stakeholder analysis is about identifying the most important stakeholders. This stakeholder analysis is perceived as broad as possible to encompass all the stakeholders relevant to both the research and project area. The project area focuses specifically on the neighbourhood in Goes-Oost but tries to be broad enough to look beyond the borders of the neighbourhood, as is defined in the theoretical framework. Some stakeholders may occur twice in the different paragraphs. This happens because these stakeholders have different purposes in the research and Goes-Oost context. The stakeholder analysis may aid the possibilities for a communication plan in the latter part of the process.

Before delving deeper into the specific stakeholders, a broad perspective of all the possible relevant stakeholders is created and can be seen on the next page. The purpose of this table is to show an overview of the direction of each stakeholder and for what part of the thesis it could help: Goes-Oost or the research part. The process of finding the stakeholders for Goes-Oost has been defined by looking at the area with a broad view and finding all the possible facilities in and around the project area. If there are any relevant facilities such as schools or health care centres, they are added as a stakeholder because they might serve the project later.

For the research part, the most important stakeholders can be found in the case studies and Marsaki itself. The case studies are separated into smaller actors and this can also be seen in the figure.

The rest of the stakeholder analysis will be a detailed analysis of what the relevance of each stakeholder is and what their purpose is for this research and project. Apart from a simple list, this stakeholder analysis will include a stakeholder matrix in the form of a power-interest grid. This will be the last part of the analysis.

<b>Goes-Oost</b>	Schools	<ul style="list-style-type: none"> <li>• Goese Lyceum</li> <li>• Ostrea Lyceum</li> <li>• De Wissel</li> <li>• Auris College</li> <li>• Prinses Ireneschool</li> <li>• Ernst Bisschopcollege</li> </ul>
	Firms	<ul style="list-style-type: none"> <li>• Marsaki</li> <li>• RWS</li> <li>• Evides</li> <li>• Delta</li> </ul>
	Inhabitants	<ul style="list-style-type: none"> <li>• Community centre Goes-Oost</li> <li>• Current inhabitants</li> <li>• Future inhabitants</li> <li>• Maros butcher</li> <li>• MAR</li> </ul>
	Municipality of Goes	
	Health Care	<ul style="list-style-type: none"> <li>• SVRZ Ter Valcke</li> <li>• Health care centre Randhof</li> <li>• Gors</li> <li>• Rehoboth</li> </ul>
	Press & Media	<ul style="list-style-type: none"> <li>• Regional media</li> <li>• ANP</li> <li>• National magazines</li> </ul>
	General interest	<ul style="list-style-type: none"> <li>• Inhabitants of Goes</li> <li>• Project developers</li> <li>• Architects</li> <li>• Contractors</li> <li>• Agents</li> <li>• Urbanists</li> </ul>

Table 1

## **Stakeholders: research**

The first stakeholder analysis will include the relevant stakeholders that aid the process of the research and will help to get the desired result. First, all the possible stakeholders were defined in a mind map. This mind map showed that there were too many stakeholders to describe them all separately. Groups of stakeholders are therefore created that show comparable purposes, goals and results.

### **Marsaki**

In this research, the consultancy firm Marsaki is probably the most important stakeholder. Marsaki is the company that is most likely to be the executor of the project in the project area. Marsaki has a lot of knowledge about the specific building of housing and can therefore aid this research a lot. They are also key stakeholder in real estate projects within Zeeland and West-Brabant. Furthermore, Marsaki has profound knowledge on building sustainably and can help the research a lot to find proper results.

### **Wooneco2**

A part of Marsaki that is most relevant to the research is the wooneco2 concept. This concept, which has been explained in the theoretical framework, focuses on building sustainably in the future. This future is already here and that is why new developments such as this research and project, should make use of the knowledge wooneco2 provides. There are several opportunities to include wooneco2 in this research in the building process. The specific person within Marsaki who has been working on is Patrick Harting. This person should be a close stakeholder in this research.

### **Municipality of Goes**

The municipality of Goes is an important stakeholder in this research because they have a lot of data available about the project area. They can get information from the municipalities' archives and might be interested in the specific research. They could offer historical, ground and network maps, which are not all available on the internet. Furthermore, they might have more knowledge about the Genius Loci of the project area, which has been explained earlier. To get to the answer of these questions, the municipality should be an important stakeholder.

### **Case studies**

There are a lot of case studies that can be identified as a stakeholder. Each case study has stakeholders on their own and those are the ones that should be independent stakeholders. However, this research will group these stakeholders because each case study has nearly the same actors involved.

### **BEL (EVA-Lanxmeer)**

The foundation called EVA (Ecologisch Centrum voor Educatie, Voorlichting en Advies) is created in 1994 with the purpose to build a bridge between the environmental policies of the government and broad groups in society, by raising awareness and participation in important issues. (Stichting EVA, 2017) 'Stichting E.V.A.' is founded from a collaboration between different professional sectors such as architecture, landscape architecture, the energy sector, agriculture, higher education, health care and art. The neighbourhood in Culemborg was the first test result from this foundation and they most likely have the most knowledge about the broad context of the neighbourhood. In the end, the 'Stichting' was denounced and transformed into a new foundation called: BEL (Bewonersvereniging EVA-Lanxmeer). This is the inhabitant's association that follows the principles initially invented by the foundation.

### **Stichting Terra Bella (EVA-Lanxmeer)**



The foundation called Terra Bella is formed by the inhabitants of the neighbourhood EVA-Lanxmeer. Since 2004, this foundation has been working together with the municipality of Culemborg. Every year, the foundation also creates a maintenance plan with purpose to define who is going to maintain which public green area. This foundation stimulates participation and by using this participatory approach, it influences the financial aspect, since more money is left over to invest in improvements.

Terra Bella has a lot of knowledge on the use of public green and knows how to create social cohesion and stimulate participation. That is why this stakeholder is relevant to this research. (Terra Bella, 2017)

### **Inhabitants**

Within each case study there are inhabitants, which are relevant for interviews and could give proper results. The relevant inhabitants are: Woongemeenschap Eikpunt, Ecowijk de Kiem, EVA-Lanxmeer and Grijskerke. These inhabitants are currently living in a sustainable neighbourhood with good social cohesion.

The leaders of the neighbourhoods are most likely to be inhabitants. These people are the most likely target group since they have the most knowledge on the different subjects.

### **Municipalities**

The municipalities are most likely to have played a role in the planning and/or execution processes of the case study projects. That is why these municipalities are relevant stakeholders that could aid this research. The following municipalities are part of the case studies;

- Municipality of Almere
- Municipality of Nijmegen
- Municipality of Arnhem
- Municipality of Culemborg

### **Stakeholders: Goes-Oost**

The second stakeholder analysis will be about the relevant stakeholders that have influence, are part or will be part of the restructuring process of the neighbourhood in Goes-Oost. First of all, all the possible stakeholders were defined in a mind map. This mind map showed that there were too many stakeholders to describe them all separately. Groups of stakeholders are therefore created that show comparable purposes, goals and results.

#### **1.2.1 Firms**

##### **Marsaki**

Marsaki is one of the main companies involved in this project. They serve as the real estate advisor for the restructuring of the project in Goes-Oost and are most likely to become the executor. This stakeholder analysis is created from the view of Marsaki, which means Marsaki should be a close actor to all the parties described and involved in the project. As real estate advisor, Marsaki considers opportunities to redirect an old neighbourhood, housing area or any other dated real estate. Opportunities in advising are renovating, restructuring, selling or replacing the real estate. In this case, the choice has been made to restructure the area. (Marsaki, 2017) Based on the real estate strategy, Marsaki will translate the demands in a concrete program. Defining clear terms beforehand will avoid any uncertainties and surprises.

##### **RWS Partner in Wonen**

RWS is a housing corporation, which rents houses to those who can't meet their own housing needs. RWS stands for 'Regionale Woningbouwvereniging Samenwerking'. (RWS Partner in Wonen, 2017) They operate in the municipalities of Goes, Kapelle and Noord-Beveland and are one of the biggest housing corporations in Zeeland. They are one of the most important stakeholders in this project since they are the supervising company. They have influence in all the developments occurring and are responsible for all the organised meetings. RWS is mainly focusing on the process and the result and has a lot of interest.

### **Evides**

Evides is the main water firm operating in Zeeland. A part of their vision is to focus on CSR. (Corporate Social Responsibility) To create an eco-neighbourhood, it is important to work together with the water company operating in the area. They should be considered in the process.

### **Delta**

The biggest energy supplier in Zeeland is Delta, a large firm operating in Zeeland, delivering 100% green energy, generated from Dutch and European wind energy, and Dutch biomass, to consumers and entrepreneurs. Opportunities with Delta about creating an eco-neighbourhood should be discussed and therefore Delta must be involved in the process from the start of the project, when going for an integrated approach.

#### **1.2.2 Municipality of Goes**

The municipality of Goes is one of the most important stakeholders since they have the largest authority over the project area. Without the involvement of the municipality of Goes, there is no project to be developed. The municipality is often interested in innovation and that is why they can play a role in the building of a self-sufficient neighbourhood. They are also a relevant stakeholder, because they are the most important investor in the area, and must authorise the change of infrastructure. The municipality is stakeholder to involve in the process, keeping them informed.

### **Inhabitants**

#### **Current inhabitants**

The current inhabitants in the neighbourhood need to be informed and involved in the process. This is the group of stakeholders that will be affected the most in the restructuring process since they are going to lose their home. The group of inhabitants consists of social renters that operate in the lower classes of society. All the possibilities the inhabitants have that could influence their new way of living should be defined carefully. After all, these people should be satisfied to create an outcome that benefits all.

Until now, the district management of Goes-Oost has informed to some of the current inhabitants about their ideas on the restructuring of their homes and the reactions were positive overall. They acknowledged that their houses were dated and need restructuring as has been concluded from the first communication meeting with RWS, Marsaki, the Municipality of Goes and the district manager.

#### **Future inhabitants**

The second group of inhabitants that is going to be affected are the future inhabitants of the neighbourhood in Goes-Oost. These are the people that are going to live in the new neighbourhood and should support the fact that participation is going to play a big role. This group of stakeholders should be involved closely by participation in the form of workshops and meetings. They play one

of the most important roles in making a neighbourhood self-sufficient since social cohesion is important.

### **District management**

RWS features several district managers in the area. There is one specific manager, who represents Goes-Oost and she has been included in the first communication meeting already. Her name is Annemieke Pieters and she is the district manager over the Goese Schans, Goes-Oost, Noordhoek and Mannee, which also includes the project area. The district manager has a few specific qualities described below;

- Knows the inhabitants of the neighbourhood and knows what is happening;
- Alerts inhabitants when they are breaking the rules;
- Can answer a lot of questions concerning the neighbourhoods;
- Can do several technical jobs;
- Works together with the police, municipality and community centre.

The district manager might be of great use when it comes to identifying the inhabitants of the neighbourhood and will therefore be involved in the meetings. (RWS Partner in Wonen, 2017)

### **Community centre**

The neighbourhood of Goes-Oost has one operating community centre located at the Bergweg 12. The centre has its own website and organises several social evenings that include billiards and playing cards. These social events aid the sense of community and social cohesion of the neighbourhood. The community centre is a relevant stakeholder and needs to be informed during the process.

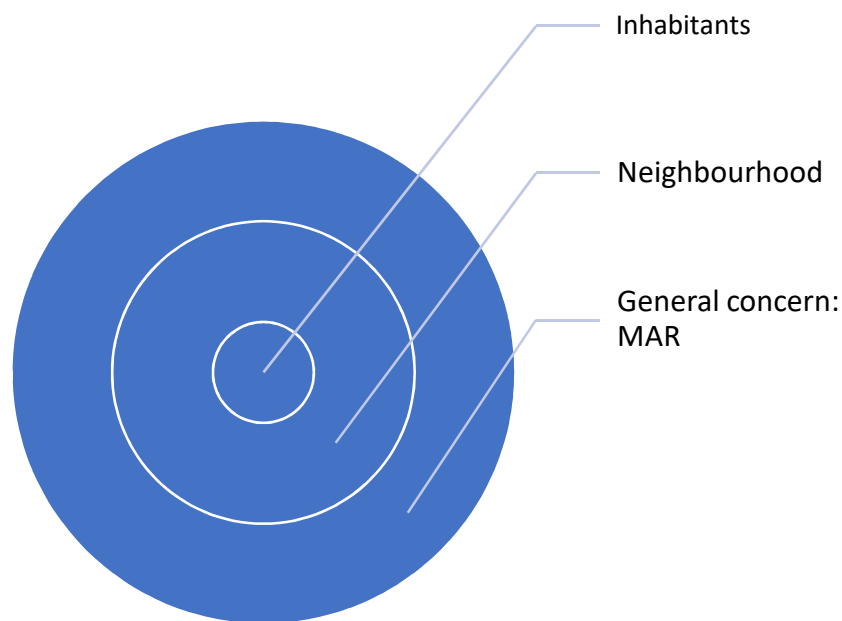
### **MAR**

The community advisory board (MAR) is an internal advisory body of RWS Partner in Wonen. They operate as the representatives of RWS such as youth, elderly, village and neighbourhood representatives. The members of the MAR are not directly related to RWS but they are socially concerned and have enough professional skills to be representative. The MAR is the broadest body of neighbourhood representatives. (RWS, 2017)

### **Maros Slagerij**

Maros Slagerij is a butcher that is located at the border of the project neighbourhood. They are a relevant stakeholder because the butcher will be affected by the noise and transport of the material when the neighbourhood is going to be constructed. This stakeholder should be informed. (Maros Goes, 2017)

The following diagram shows the levels of inhabitants in a relation hierarchy.



## Healthcare

There are several care centres present in and around the project area. The first one is **care centre Randhof**, which is located at the border of the project area. This is a care centre that facilitates 78 elderlies. Apart from housing, the care centre has a nursing unit present as well. (Zorggroep Ter Weel, 2016) The second health care centre that is located at the border of the area is **SVRZ ter Valcke**. Ter Valcke is a big health care centre that incorporates a lot of facilities. It can house 165 inhabitants. It has his own restaurant and physiotherapy. These two health care centres are relevant because they can be integrated in the plan for the neighbourhood and is therefore a great advantage. (SVRZ Ter Valcke, 2017) The third health care centre is **Gors**. This centre focuses on the health care and support in living, working, daily activities, studying and recreation to more than 800 children, youth and elderly with a mental disorder. (Gors, 2017)

The last health care centre present in the area is **Rehoboth**, which is a relatively new centre for elderly. As well as housing, they provide home care. All these centres are of great relevance to the neighbourhood since they provide health care on walking distance and raise the health of the people living in the neighbourhood. These centres can be a key factor in building and promoting the new neighbourhood. (Cedrah, 2017)

## Schools

### Goese Lyceum

The Goese Lyceum is a secondary school located in Goes-Oost. The school is part of the Pontes Scholengroep and operates within a recently built building. It is located almost directly next to the project area and is therefore one of the stakeholders. This stakeholder needs to be informed along the process. Also, there are opportunities to get the school involved in the developing process since there are a lot of students that could get some experience out of the building process. This raises the goodwill of the organization and helps education. (Goese Lyceum, 2017)

### Ostrea Lyceum

The Ostrea Lyceum is another secondary school located in Goes-Oost. This school is built around the neighbourhood and has several locations. The school offers education to all levels and therefore an open school with good perspective. (Ostrea Lyceum, 2017)



## **De Wissel**

De Wissel is a secondary school for students who have difficulties with by studying theory but do have the ability to perform practical skills. De Wissel means the switch and stands for a change from student to professionalism. (Wissel, 2017)

## **Auris College**

The Auris College in goes is a basic secondary school for students with the age of 12 to 21 years old. The education revolves around students who have problems with language and understanding. The students will be prepared for the job market or further studying. (Auris College, 2017)

## **Bisschop Ernstschool**

The Bisschop Ernstschool is a primary school located in Goes-Oost, next to the neighbourhood church.

## **Prinses Ireneschool**

The Prinses Ireneschool is the second primary school present in the area of Goes-Oost. It is a unique school because it is a Christian school and therefore makes a distinction from the other primary school previously mentioned. The two primary schools are located next to each other.

## **Press & Media**

### **Regional media**

The press is an important stakeholder because they have the ability make or break a project. The world is operating in the information era and online services such as social media are having their impacts as well. On a regional scale, the local newspapers are still operating and reaching the important local inhabitants. The regional media will most likely be interested in the developments around the project. Regional newspapers such as the PZC (Provinciaals Zeeuwse Courant) and 'de Bevelander' can be used as source to show the developments along the process to the public. Furthermore, Omroep Zeeland is a broadcasting network in the province of Zeeland. This can also function as a platform to show developments to the public and they must be satisfied.

## **ANP**

ANP stands for the General Dutch News Agency and is the biggest news agency operating in the Netherlands. The news agency provides radio broadcasts and video reports daily. Building a self-sufficient neighbourhood reaches national attention and that is why ANP might be a relevant stakeholder.

## **National magazines**

There are a lot of professional magazines on the market in nearly every professional subject one can imagine. Also in this sector, a lot of magazines are available. These magazines might be interested in this project since it has an innovative aspect. Magazines that might be interested are in the subject of construction, architecture, urban planning and sustainability.

## **General interest**

Making a neighbourhood self-sufficient raises the general interest of a lot of different types of stakeholders that haven't been mentioned yet.

## **Inhabitants Goes**

Since the developments of the project are occurring in the city of Goes, a general interest of the inhabitants of Goes might rise. They would like to know more about the project and all its developments. The inhabitants are also the main target group for becoming the new buyers or renters of the houses in the neighbourhood.

### **Professionals**

There is a wide range of stakeholders who might be interested in such a project. The most important professionals are project developers, architects, contractors, agents and urbanists.

### **Stakeholder matrix**

The final part of the stakeholder analysis will be the integration of all the stakeholders in a matrix in the form of a power-interest grid. This is executed to summarize the understanding of all the stakeholders and a clear overview is created to which ones are most likely to be blockers or critics, and which ones are most likely to be advocates and supporters on the project.

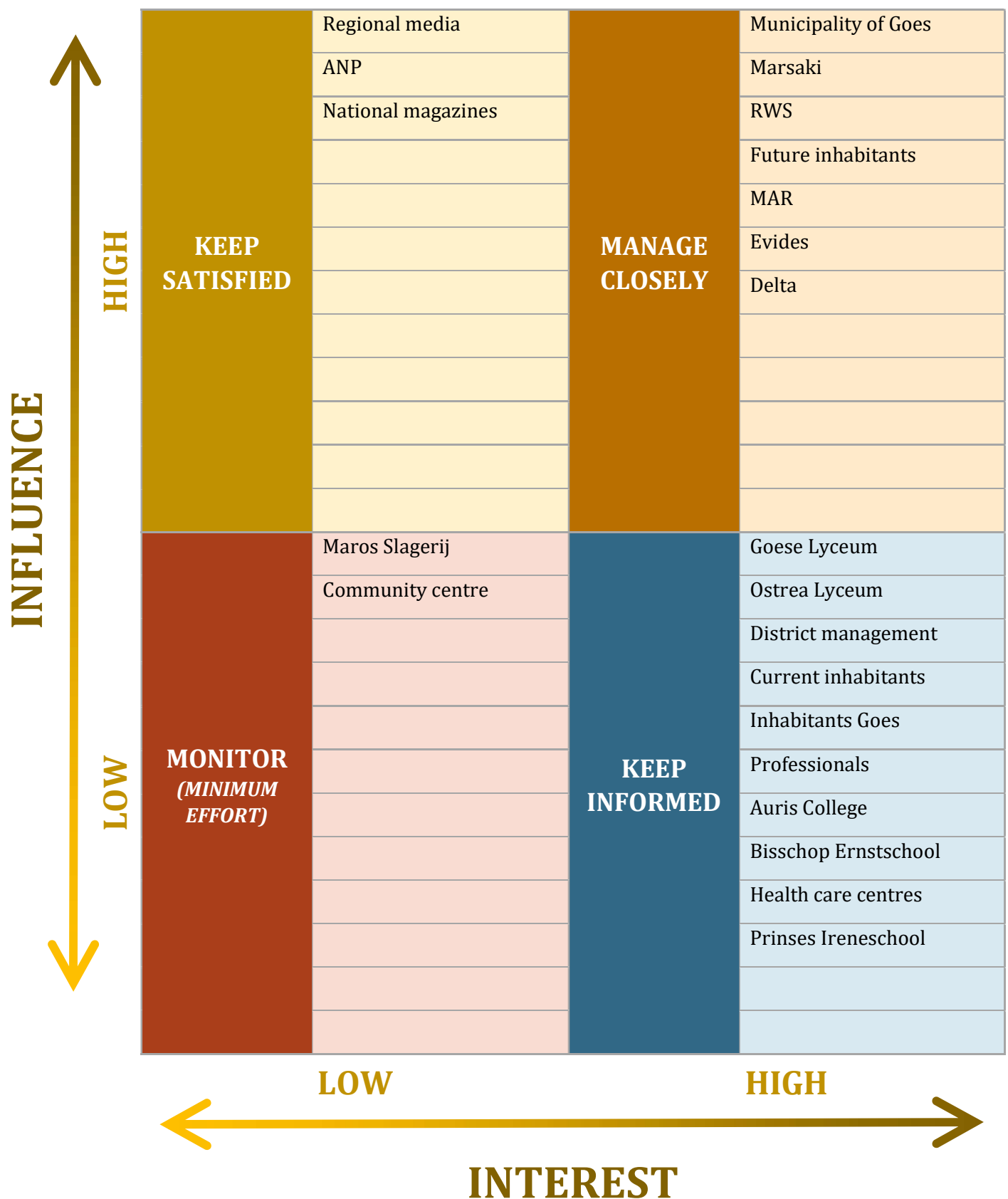
(Thompson, 2016)

The grid on the next page shows four different positions and shows the actions that are relevant to the single position:

- High power, High interest: These are the stakeholders that must be fully engaged in the process and need the greatest efforts to satisfy.
  - High power, low interest: These are the stakeholders need enough work to keep them satisfied, but no too much so there might be the possibility they will lose interest in the project.
  - Low power, high interest: These are the stakeholders that need adequate informing, and there should be enough meetings to avoid any possible issues. These stakeholders can often be very helpful with the detail of the project.
  - Low power, low interest: These are the stakeholders that only need to be monitored, since they don't want to be bothered with excessive information and communication.
- (Thompson, 2016)

The stakeholder power-interest grid can be seen on the next page and shows the previous mentioned stakeholders in the different positions, defined by the author. The grid only shows the stakeholders defined in the specific Goes-Oost paragraph since that is what the thesis should focus on.

## STAKEHOLDER ANALYSIS MATRIX



## Conclusion

To be concluded, the stakeholder analysis shows that this project area has a lot of opportunities since it houses numerous health care and educational facilities. There are schools present for nearly all level types and age categories and there is a wide range to choose from. As for the health care centres, they do not only offer housing for the elderly, but also house several wellnesses related such as fitness and physiotherapist opportunities.



## Appendix 3 ‘Case study research’

The extensive research to the previously mentioned case studies is part of this thesis. Results of the case study research are described in this chapter and should aid the answering of the sub questions. The case studies are divided in different paragraphs: ReGen Village, EVA-Lanxmeer, Hof van Heden and the Olmentuin. Each case study will have a content that looks as followed:

- **Introduction**
- **Themes**
  - Water
  - Energy
  - Urbanism
  - Environment
  - Participation
  - Finance
  - Process
- **Conclusion**

Based on these principles, a catalogue will be created.



### ReGen Village

ReGen Villages is a new model for the development of off-grid, integrated and resilient eco-villages that can power and feed self-resilient families around the world. The creation of these neighbourhoods is relevant to this research since the village is trying to make inputs from outputs, becoming circular. The concept takes a holistic approach and combines a variety of innovative technologies, which are needed for the neighbourhood of the research. The ReGen Village wants to tackle some of the rising issues and challenges the world is facing now. Think of for example: growing population, increasing urbanization, scarcity of resources, the growing global food crises and reducing the CO2 emission.

An important note that has relevance to the research is the fact that the ReGen Village is trying to use applied technology, and using already existing technologies and applying them as integrated whole in community design, providing clean energy, water and food. The first ReGen Village is planned to be built in Almere. An example of what the ReGen Village could look like is shown in figure 6. (Tue Hesselberg Foged, 2016)

### EVA-Lanxmeer

EVA-Lanxmeer is a neighbourhood that strives to combine living with working, recreating, drink water winning, education and producing food. The neighbourhood has high ambitions to combine cultural history, landscape, water, energy, use of material, mobility and participation in developing a sustainable neighbourhood.

In 1994, the EVA foundation called ‘Stichting EVA’ was founded with the purpose of delivering a contribution to the development of a sustainable and environmentally conscious society. By creating an interdisciplinary collaboration, the foundation wanted to create an ecological neighbourhood and providing the public with all the knowledge acquired in the process of

building this neighbourhood. The foundation created a new model together with other experts: The EVA-concept. This concept contained several criteria the urban plan should consist of. This design principles were meant for all locations.

### **EVA-concept**

A lot of environmental aware concepts have been created already, but the EVA-concept is a distinction since it uses an integral approach, bringing together nature technique and culture. EVA integrates the use permaculture, bio-ecological building and a careful organic design. This means that a lot of attention is needed for the decentralization of the nitrogen cycle and the creation of biodiversity. This integrated approach, as it is described, can't be accomplished without the involvement and participation of the inhabitants of EVA-Lanxmeer. The EVA-concept uses the following 8 focus areas:

1. *Participation*: The neighbourhood in EVA-Lanxmeer is unique since it values participation and acknowledges that it should always be incorporated in the creation of a neighbourhood. The neighbourhood invites people to work and live in the area, by participating in the self-management of the maintenance.
2. *Architecture*: The central goal of the EVA-concept should work together with the various environmental aspects such as water, ground, energy, energy and biodiversity where they also incorporate health, experience and well-being in the design process.
3. *Permaculture*: The linear thinking style creates a disjunctive view of the different criteria that are included in life such as production, transport, living, working and recreation. These functions create a lot of waste such as polluted air, surface and water, and a lot of solid waste. The use of permaculture in a design and cycle will solve linear views. The waste that comes out of these separate systems, might be an input to another system. This creates circularity. For example, the organic waste can be used as compost for the gardens of the inhabitants.
4. *Flora & Fauna*: nature and the built environment should not be seen as two entities excluded from each other. Cities offer a lot of opportunities for excluded species in their small environments. The use of roofs, terraces, conservatories, fronts and other platforms offer opportunities to enforce the micro environments within a neighbourhood. For example, the realization of a water cycle, by minimizing the paved areas, the application of green roofs and the creation of rain water ponds, the water is buffered and can be re-used within the climate of the neighbourhood. Furthermore, green roofs, ponds and unpaved areas are living environments for plant and animal species. By designing EVA-Lanxmeer, a lot of attention has been paid in maintaining and strengthening of the existing landscape qualities, which also enhances the quality of life for the inhabitants. Measures that could be taken are the creation of kitchen gardens, decentralized composting, green roofs, integration of fruit trees, wild flowers and ponds.
5. *Energy*: One of the most important energy uses is transport. The neighbourhood needed a combination of living and working, where the need of transport should be diminished where possible. Possibilities are public transport and good neighbourhood accessibilities. The energy demand will be supplied by passive measures. This is possible by using good orientation to the sun on buildings. The use of natural climate control will be part in the energy process. Examples are the use of trees as natural shade, eaves, tree rows as wind breakers and hedges to prevent transmission losses. Inside the buildings, good cohesion between warmth accumulation and isolation is necessary to produce sustainable energy. The energy that is still needed will come from renewable energy sources such as sun panels, wind energy, bio gas or geothermal energy.

6. *Water:* The use of water in a small country like the Netherlands is always scarce and the demand is always rising. The use of water in life is essential and that is why the EVA-concept tries to get a different view on the use of water in the neighbourhood. Now, in the Netherlands all the used drink water becomes waste water and needs purification. An increase in drink water consequently means an increase in waste water and demand for purification. In the EVA-concept, water saving toilets and fixtures will be implemented. Other water qualities, such as using rain water for washing machines purified grey water for the toilet flush are implemented to save drink water. To create the best natural water cycle, it is important to implement sustainable water measures to infiltrate such as green roofs, rain water ponds and minimizing the paved areas as has been explained in the energy part. Water should be used in combination with recreation, to improve the quality of life. The whole cycle of waste water is purified on a local level and reused. The waste sludge is composted and reused.
7. *Building materials:* The neighbourhood will be built using as many renewable and sustainable building materials as possible. Renewable building materials are the raw materials that can grow without damaging the natural environment. Materials like wood, cork, linseed oil based paint, shells, paper, and for example wool. Furthermore, renewable materials such as glass, metal, roof tiles and brick have the advantage of being attractive and environment friendly. A neighbourhood is realised that considers sustainability in all phases of the building process such as the winning of raw materials, the processing, transport of materials, the use and the demolition.
8. *Waste:* The EVA-concept perceives waste differently than other neighbourhoods in the rest of the Netherlands. The waste is reused and recycled as a raw material. Organic waste is being composted and reused in the biogas installation. Building waste is stored and is primary reused. The secondary waste from building materials are going to be replaced in recycling centres. Within the houses and on the neighbourhood level, there is the ability to separate waste. (EVA, 1995)

## Co-production

The neighbourhood was created together with the Municipality of Culemborg and the province of Gelderland. These municipalities gave EVA-Lanxmeer the opportunity to implement the plans the way they wanted it to be.

## EVA tracks

EVA-Lanxmeer had several tracks that came forward from the EVA-concept.

- Urbanism
- Landscape
- Mobility
- Chain management
- Water
- Energy
- Participation
- Communication and education

The specific program requirements were written down in the report of Lanxmeer in 1998. (Gemeente Culemborg and Stichting EVA, 1998) These important tracks are being used in this research to analyse the different options that might be implemented in the case of Goes-Oost since this encompasses nearly all aspects that should be researched to create an eco-neighbourhood.

The most important elaborations and concepts resulted from the implementation of the neighbourhood in Lanxmeer are defined in this table.

## Water

The neighbourhood perceived water as three different streams: rain water, drinking water and waste water.

### *Rainwater*

Rain water that will fall on rooftops is captured, where possible, and used in washing machines. This calcium poor water has excellent criteria for the usage in these machines. The rest of the rain water was not going to be captured and buffered to the surface. The reduction of paved areas influences the quantity of rain water captured.

### *Drinking water*

All houses in the neighbourhood were going to be connected to the main water network. The usage of this water network was reduced as much as possible due to the capturing of rain water as is described previously.

### *Waste water*

A distinction was made between grey waste water and black waste water. Grey waste water is the water consumed by showers, baths and sinks. This was captured by a common water purification system. This waste water is lightly contaminated and can be therefore be released in the surface after purification. Black waste water on the other hand, is transported to a common drain. Then, the solid waste is separated from the fluid waste and used for the winning of biogas. The rest of the water is flowing to the main sewage system.

During the process, the neighbourhood conducted a lot of research of the average water use in a normal house. A graph from opMAAT, a sustainable architectural firm, showed that an average of 143 litres of water use per day is normal. Sustainable use of water resulted in 104 litres per day and 'other use' of water resulted in 61 litres per day. EVA-Lanxmeer mostly wanted to create houses that went for 'other use' of water. This means that a combination of water saving installations together with the acquiring of different water sources, such as rain water, treated waste water and process water, will result in a reduction of 55% of water use relative to a normal neighbourhood. As resulted from the research of EVA, the collection of rain water depends very much on the availability of surface and the use of this surface, such as paved and unpaved areas. (Gemeente Culemborg and Stichting EVA, 1998)



*Figure 1 Above water-drainage having the purpose of being a playground.*

The interview with Pierre Bleuzé, who was part of the firm opMAAT, revealed that the water plan of EVA-Lanxmeer was one of the most innovative projects and they built a consistent renewable system. To collect the black water, they created a separate sewage system. The drink water is coming from the central installation. Also, a seasonal storage pond is present in the centre of the neighbourhood. This pond varies in height depending on the season. Furthermore, if one subtracts water from the surface, the water gains a certain temperature. That is where water can be



combined with energy winning. The interview with Mrs Kaptein revealed the most important implemented aspects in the water system:

- The restriction of paved areas resulted in a lot of green space, where water could be caught.
- The catchment of rain water from roofs in several ponds.
- The rain water on the streets lead to several ditches.
- The separated purification of grey water (domestic water) and black water (toilet water): the creation of helophyte filters. Helophyte filters spread the wastewater in a smooth layer several centimetres below the surface of the filter. The water is led into the filter below the surface to prevent unpleasant odours. The wastewater seeps through the layer of sand and the roots where it undergoes biological treatment. A drain is placed at the bottom of the sand filter to capture the treated wastewater. Iron or copper particles are generally added to the sand layer to bind phosphates. Films, layers of clay or concrete ensure that the helophyte filter is hydrologically completely sealed from the ground. (Hiltrud Pötz, 2012)
- The black water should have led to the biogas installation, which was initially planned, but hasn't been executed in the end.
- An overview of the integral water system can be found in the interview of Mrs. Kaptein.
- The cooperation between different water sector companies worked as followed:
- Vitens: Responsible for grey water and black water, heat, building in the water retention area, ecological development of water win area.
- Waterschap Rivierenland: retention capacity, change natural shores. They were also responsible for the development and maintenance of the helophyte filters.



*Figure 2 The helophyte filter in EVA-Lanxmeer in winter period*

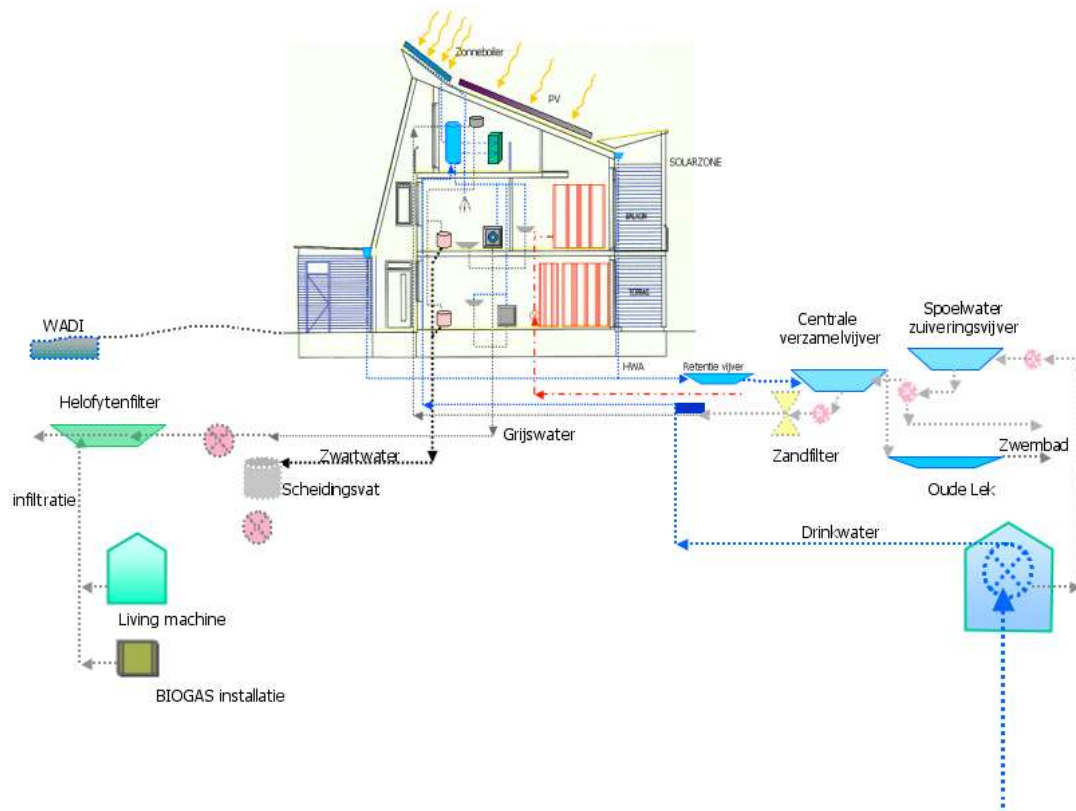


Figure 3

The figure above shows the main water concept implemented in the neighbourhood of EVA-Lanxmeer. As can be seen, all the previously mentioned aspects are considered and working as an integrated whole. The biogas installation is added in the water system figure, but hasn't been executed in the project since the last project, which was called project EVA-Centre hasn't been executed. As can be seen in the figure, the water network uses the different types of water (grey water, black water, drink water), and separates them over the different purification and infiltration techniques. The collected rain water will flow to the WADI and the grey water will flow to the helophyte filters. The black water will be collected in a separation vessel and was supposed to go to the biogas installation. Drink water will come from the normal installation and will flow to the houses. This water system is effective and might be a great opportunity in the research neighbourhood.

## Energy

The neighbourhood initially had four main concepts developed for creating sustainable energy in their buildings. There were four different types of buildings. The first one was a traditional building that still have the normal gas and electricity net. The second one were the 'all electric' houses that were facilitated and heated by a heat pump. The third option were the 'all-gas' buildings that were facilitated by a small-scale CMP (combined heat and power, a system in which steam produced in a power station as a by-product of electricity generation is used to heat nearby buildings). The last concept was the 'autark' houses. The energy supply of these buildings should be realised by the generation of biogas, sun- and wind energy.

The houses in the neighbourhood all have these specific criteria and have a specific implementation plan as is described in the plan of Stichting EVA. (1998) Important for this

research, is to look further than just the houses and making the neighbourhood energy neutral. The initial plan included the creation of two windmills.

The creation of building clusters was also part of the urban plan. This meant that the CMP installation could warm a cluster of buildings. By making clusters of houses important aspects should be considered such as positioning to the sun, facade, façade construction and daylight supply. More explanation on the urban plan is given in the urbanism paragraph. (Gemeente Culemborg and Stichting EVA, 1998)

Also, Pierre Bleuzé explained that the water subtracted from the surface gains a certain temperature and therefore brings energy. This energy can be contained by installing a heat pump. The heat pump will decrease the obtained water and this releases a lot of energy. For example, by lowering 10 cubic litres of water with 2 degrees, one can increase 1 cubic litre of water with 20 degrees. This is a very suitable technique used in nearly every house in EVA-Lanxmeer.

Also, it is possible to subtract energy from the open air. This is a widely-used source of energy in Germany, where a heat pump is situated next to the house and subtracts warm energy from the warm air. It is important to use all surrounding heat that could complement each other. This brings certainties in the form of fluctuating outside temperatures and this might bring problems to the heat pumps.

The interview with Mrs. Kaptein revealed the most important implementations of the energy system and an overview can be found in the interview:

- Following the principles of the Trias Energetica concept, which has been described earlier in the research.
- The application of this discipline lead to the cooperation of energy experts and resulted in the winning of warmth from pumped drink water.
- At the time of project EVA-Lanxmeer, the average EPC was 1.2. The EPC of the EVA-Lanxmeer houses was at the time 0.6 and more innovation is possible now.
- Optimal use of passive solar energy.
- Low-temperature wall heater.
- The creation of a low-temperature heat network.
- The winning of heat from ventilation.
- All the houses are provided with solar boilers.
- The energy partly comes from PV cells and solar panels.
- A detailed overview of the energy network will be added.

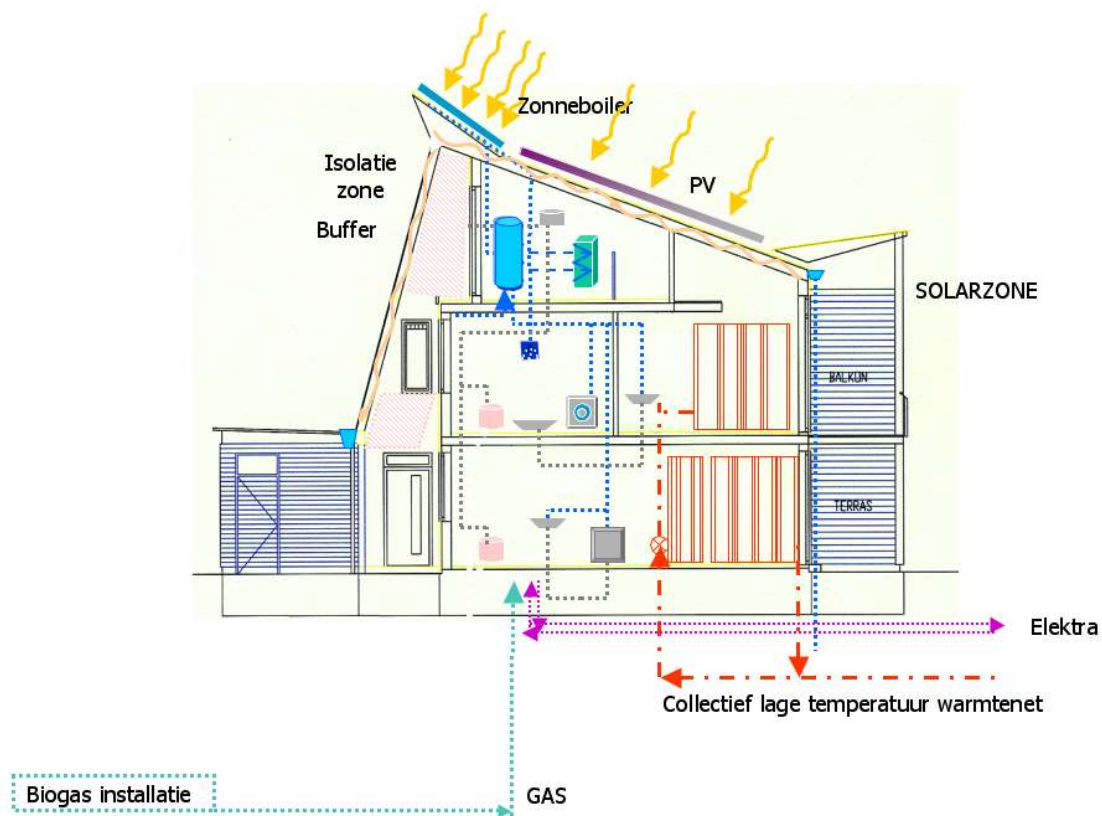


Figure 4

The figure shows the energy system on house level. This is the way it has been implemented in the neighbourhood at the time. Yet again, the biogas installation is part of the schematic overview but hasn't been implemented in the end. By having the biogas installation, the energy system had the opportunity to have a separate energy network. There are several concepts that work as an integrated whole to make the house sustainable, giving it a low EPC value. At the time, these were the most suitable solutions but now there is a lot of innovation on sustainability and these solutions will be worked out further in the research.

## Urbanism

The main goal of the neighbourhood was to create and enhance urban ecology. This means that the live and work environment should give space to a vivid integration of urban, natural and agricultural elements and functions. Both the public and private outside area should be characterized by ecological diversity and sustainable usages. (Gemeente Culemborg and Stichting EVA, 1998)

In Culemborg, the interview with Pierre Bleuzé revealed that the board made the decision to diversify the typology of houses by incorporating apartments, terraced houses and villa's. EVA-Lanxmeer had the restriction of building on pillars, since it was in a water-win area.

Part of the urban plan in EVA-Lanxmeer, is about creating solid mobility. The project identified three main traffic concepts: Slow transport, public transport and motorised transport.

- *Slow transport:* The pathways that are used by hikers and hitchhikers make for an attractive run to the houses, the heart of the neighbourhood, the station, the centre of the city and the outside area. The neighbourhood also focuses itself on creating a partial car-free district. This asks for great storage capacities and solid pathways for bikes.



- *Public transport:* Lanxmeer has great accessibility to the big city of Utrecht, through a nearby train station.
- *Motorised transport:* Motorised transport has mostly been discouraged in the neighbourhood. This is a very innovative aspect and needs great care. There aren't any main connecting roads running through the neighbourhood. All houses must be accessible by car though, for loading and unloading. The specific access routes have been included in the neighbourhood. Further parking space should be incorporated at the borders of the neighbourhood. This is a great opportunity in Goes-Oost as well, to tackle the current lack of public green space and to create more space for other purposes that aid the quality of life. (Gemeente Culemborg and Stichting EVA, 1998)

The parking norm in EVA-Lanxmeer was set at a rate of 0,5 parking spaces per house. Further research should be done to evaluate how much parking space is necessary in Goes-Oost.

The urban plan had been redefined several times and in the end included an area of 30 ha. 6 ha consisted of living space, 4,5 ha consisted of working space and 1,5 ha consisted of a combination of living and working. Furthermore, 4 ha was set out for the creation of a city farm that incorporated the permaculture principles.

Mobility has been incorporated very strongly in EVA-Lanxmeer. 1 parking space per house and the use of 'Wheels for All' are examples: opportunities to rent houses. All the houses are accessible by car but it is not allowed to park your car in front of your house permanently. Parking lots are built at the borders of the neighbourhood. There are nearly no main roads and there are a lot of hiking and biking paths. This results in a lot of space for social contact and recreation.

## Environment

The environmental aspects of EVA-Lanxmeer mainly focused itself on maintaining the existing landscape value, also known as the *genius loci*. The cultural historical values in the neighbourhood are highlighted strongly and considered in the urban plan and environment. The landscape has been ordered into four zones:

1. *Direct surroundings of buildings and private properties:* this zone encompasses the outside area at the houses. This outside area has a strong private ambiance. Enough space for terraces are included and the plantation has partly been influenced by privatization. Furthermore, these plants can be used to serve as enrichment of public green or fruits.
2. *The borders of private property and public green space:* this zone is located further away from the privatized areas that are used for recreational purposes or the harvesting of fruit and/or vegetables. Furthermore, this area has the purpose of being public green space and having the same goal.
3. *Intensively used public space, parking lots:* This zoned encompasses all the public space in the project area, where the main ambiance should have a 'residence character', where children can play.
4. *Sustainable agriculture with educational and social functions.* (Gemeente Culemborg and Stichting EVA, 1998)

A subject that comes back many times in the plan for EVA-Lanxmeer is the implementation of the concept 'permaculture', which has been explained in previous chapters. (Gemeente Culemborg and Stichting EVA, 1998)

According to the professionals and Mrs. Kaptein permaculture has five important assumptions in EVA-Lanxmeer: A cooperation between human and nature, the importance of autonomy, recycling material, development of self-sufficient systems and the creation of circular cycles (comparison

with Cradle to Cradle), the usage of sustainable water and energy sources, the improvement of the local food production. It is important to highlight that according to Mrs. Kaptein and the concept of permaculture, it does not just belong to one theme, but encompasses all themes and sees it as an integrated whole.

## **Participation**

Resulting from the interview with Pierre Bleuzé, it came forward that the neighbourhood of EVA-Lanxmeer made use of common green space. While buying a home, or renting one, the potential inhabitants agreed to buying a part of the common green space and contributing to the management of these areas. This increases the chance of success and enhances the participation of the inhabitants.

Furthermore, Pierre Bleuzé said that participation can make or break a project. If the project is not using social cohesion as a pillar, it will most likely fail. This is a big risk to take. For example, the decision should be taken between common green space and organized gardens and borders. Participation includes both ambition and risks. It is important to make sure that future inhabitants will get 'emotions' with the neighbourhood and are willing to invest their time and money in it. Possibilities to do this are conducting of workshops, setting realistic goals, giving courses and including them in the process. It is important to look at the participation ladder, by first empowering the people, and in the end giving the inhabitants their own responsibility and having enough knowledge.

A shared car project has been done in EVA-Lanxmeer to decrease the pressure of cars in the neighbourhood. This is both good for the environment and participatory approach and enhances the social cohesion between people. (Gemeente Culemborg and Stichting EVA, 1998)

Thus, from the interview with Mrs. Marleen Kaptein, the most important implementations in the participation theme were discussed. Before the project even started, participation was an important theme in the process part. The involvement of future inhabitants was already happening at the preparation of the first urban design. Excursions had been held and three workshops were held, which resulted in the creation of the 'inhabitants book' that included the wishes and ideas of the future inhabitants. Overall participation was important and an overview was created for EVA-Lanxmeer. From the start of the project the future inhabitants had influence on the urban design, which led to the creation of the BEL in 1998. A housing need survey showed a wide range of diversity in types of houses. Also, they were given the authority to create the common courtyards.

## **Finance**

In the case study research, it was hard to find any evidence about the financing of creating an ecologically sustainable neighbourhood.

## **Conclusions**

- The EVA-concept has been a success in practice. The goal to involve the inhabitants in the initial process of the project and to make them help shaping the sustainable living environment and giving them more authority has been achieved.
- The 'life style' of adults and children has become more sustainable and this can easily be demonstrated.
- The authority on neighbourhood level, lots and houses increases the involvement and quality of life.
- The neighbourhood stays attractive and the real estate value has stayed the same.

These are the most important results the neighbourhood has achieved according to Mrs. Kaptein. Furthermore, there are various success factors that could help a project. To create success a well-funded story must be created that shows clear ambitions and should make the owner enthusiastic, since ground acquisition is necessary to realise the initial ambitions. Then, a selection of skilled professionals is necessary that can and are willing to cooperate to the benefit of the project. A common goal should be set between the different disciplines to overcome possible problems and issues. While executing project management, it is important to observe your own responsibilities and leaving space for equality between different professions and future inhabitants. The importance of communication within the process should be highlighted once more since this can be the most important success factor. Within the communication sector it is important to consider the inhabitants and users as professionals apart from the actual professionals. Before the start of the project, it is important to create clarity about what the level of participation is going to be and qualifying the inhabitant as collaborator. In the financial plan, it is important to incorporate room for cooperation and this also brings additional costs. Then, it should be highlighted that the inhabitants should get their responsibility when they are ready for it, and when they are able to carry the responsibilities. When people recognise the fact that more can be reached when combining disciplines together, it is possible to create neighbourhood with such a scale. These are the most important conclusion made from the interview with Mrs. Kaptein.



## Impression



(Author, 2017)



## Hof van Heden

Hof van Heden, which is in Hoogvliet, was not just a usual neighbourhood. Being a district of the highly-urbanized area of Rotterdam, it was necessary to create a neighbourhood that met to the demands of the future. (Vereniging Hof van Heden Hoogvliet, 2016) An initiative started where a cooperation emerged between Welcome in my Backyard and Vestia (social housing corporation). (Hiltrud Potz, 2009) A group of residents were given the opportunity to give their input on the design of the housing project. The future inhabitants were involved by doing workshops along the process, and had saying in the creation of the design, which was done by architecture firm opMAAT. This case study has been chosen resulting from the interview with Pierre Bleuzé. He explained that Hof van Heden serves as a good case study where a combination of themes has been implemented such as water, energy, participation and biodiversity. This is therefore a relevant case study to be researched and the themes, as defined in the theoretical framework, will function as the guideline through the process.

### Water

There were many water aspects incorporated in the neighbourhood and they are written out below:

- *Above-ground precipitation drains and buffers:* Adobe-ground drainage of rainwater keeps water visible in the city and is in many cases less costly than installing a separate improved system. It makes the water system visible and poor connections in this system can be prevented. Another advantage shown in the neighbourhood is that residents are less likely to cause pollution through household activities since they are more aware of the water running through the area. Above-ground drainage also avoids puddles. Other possibilities include open gutters, sunken channels, covered gutters and open water channels and these variations can drain larger amounts of surface water. This technique has been proven to be successful and contributes to the natural environment. (Hiltrud Pötz, 2012)
- *Buffering and infiltration:* Buffering and infiltration of heavier rain fall due to climate change is an important aspect to integrate in an urban plan. Rainwater buffering facilities applied Hof van Heden were realised by reducing the proportion of hard surface areas and introducing green roofs, rainwater pond, underground reservoirs or decentralised infiltration systems. According to Pötz, (2012) the form of infiltration depends on the permeability of the ground, the groundwater level, the quality of the runoff and the space available for infiltration or buffering facilities. Thus, Hof van Heden showed that paved surfaces should be restricted as much as possible. Secondly, Reducing the area covered by paved surfaces, the design gets livelier and microclimate is also improved by evaporation. (Hiltrud Pötz, 2012)
- *Wadi's (bioswales)* is part of the buffering and infiltration and are also incorporated in Hof van Heden. A wadi is a ditch with vegetation and a porous bottom. The top layer consists of enhanced soil with plants. The location of the wadi can be found in the figure that shows the urban plan. The area required to build a wadi system is approximately 16% of the total area of a new district. This percentage includes the use of gentle nature-friendly banks. The bioswale system can be combined with green facilities in the district. When combined, bioswales and green facilities do not take up more space than usual in a district. (Hiltrud Pötz, 2012)

The new water system resulted in the elimination of rain water from the drain system, and prevents overflow from happening.

### Energy

Water works together with energy and this also occurs in this neighbourhood. The project incorporated the ecological garden designs and the ecological management and this resulted in an EPC of 0.6. The project also incorporated sustainable materials such as sand-lime bricks, modified wood, partial flax wool insulation and ecological paint. The homes are ventilated using natural means and are extremely well insulated.

## Urbanism

In the urban plan, some criteria were set by the housing corporation Vestia:

- 28 apartments were going to be realised;
- 32 ground-level homes were going to be built.
- A combination of public housing and owner-occupied homes were going to be realised.

The homes were supposed to be built around a communal garden, which was located centrally in the neighbourhood. The concept consisted of small private gardens without fences or hedges separating them. (Hiltrud Potz, 2009)



Figure 5

The figure shows the urban design of the neighbourhood and reveals the small private gardens accompanied by the communal gardens and the pond. (Vestia, 2009)

## Environment

The landscape in the neighbourhood was chosen very carefully. The inhabitants created an outline of the communal gardens and sat down with an ecological landscape gardener to design the plan for the vegetation and helped put the plan into practice. The residents are still responsible for the maintenance and management of the area and its gardens. Play areas with

large sandpits and water pumps were also implemented and positioned close to the ground-level homes because the families with young children live in these homes. (Hiltrud Potz, 2009)

### **Process**

A group of future residents were involved when the architects were selected. Their views of the building instructions and the shape given to the group process led to architectural firm opMAAT to execute the plans. The plan was given shape and completed by the assistance of potential future residents, and was also based on the vision and results the workshops and meetings gave. The process mainly started with the participation concept, where meetings and workshops were held on Saturdays about the urban plan and design. Also, communal gardens were part of the plan, where the inhabitants were the owners. Trips were organised to the neighbourhood of EVA-Lanxmeer, since this successful neighbourhood served as an example for this project.

The project has been in use for some time now and is very successful. The goal was to create a socially and ecologically sustainable project without added cost. The project was realised successfully because it had a highly-integrated approach from the start of the project. (Hiltrud Potz, 2009)

### **Participation**

Research has shown that participation of future inhabitants is one of the most important themes in creating a sustainable and ecological project plan. As is described in the process part, the participation plan started with workshops about the urban design, home design and communal gardens design. (Hiltrud Potz, 2009) Presentations were also given about the details of the architectures plan opMAAT. Then, the residents formed working groups on how to manage the gardens, and how to give shape to the contracts. By involving the future residents in the initial part of the process, it once again proves that a neighbourhood creates a good social bond.

### **Finance**

The research to this project showed that this neighbourhood has been realised without any extra costs. This has been achieved by the integrated and participatory approach between inhabitants, corporation and municipality. A solid process could lead to a great project without any added cost.

### **Conclusion**

This project has proven itself to be successful on all aspects. It shows that the only way to be successful is by using a participatory and integrated approach working together with inhabitants, the architectural firm, corporation and municipality.



## Impression





## Olmentuin

The Olmentuin is the creation of a sustainable, energy-neutral neighbourhood between the green, where people have all the facilities within reach, such as health care, shops and cultural activities in Steenberg.

There are a few assumptions for the urban plan that make this neighbourhood suitable for this research since it is a comparable project to EVA-Lanxmeer in Culemborg, using an integrated approach. The idea of doing research to the Olmentuin comes forth from the interview with Patrick Harting.

- The urban plan's assumptions of the residential area characterize itself by living sustainably together and living around a public garden with the key factors being: green, rest, nature, variety, friendly varied buildings between the green, spatial diversity with high and low vegetation, public spaces, pathways, water and a diverse range of flora and fauna.
- The houses and possible added facilities are becoming lifecycle resistant and will become energy-neutral where the current demands can be facilitated and future generations won't be limited.
- Village/landscape atmosphere of houses and public space.
- The houses are situated on broad parcels.
- The back side of the existing houses will be excluded from the sight.
- Simplicity will be the key.
- All the houses will be oriented towards the sun.
- Houses will be oriented towards the communal garden and where possibly will have a transition to the green public space.
- The garden will be equipped with an edible park with a communal meeting place.
- The green appearance should have the overhand in the neighbourhood.
- A lot of attention should be made towards the water management.
- Use of sustainable and natural materials should be incorporated.
- The creation of a natural ecosystem within the garden and houses with edible plants and partly green fronts as base. The creation of a living environment for the consumers of producers, animals and plants/trees will then be maintained. Let the nature create a natural environment and avoid strict gardens.
- Use the existing environment as much as possible. Use the trees that have to be taken down as benches and use the existing trees as forming shades for the sides of houses. Use the excavated soil to make new hills in the gardens. They could also be used as vegetation on for example rooftops of houses.
- Try to consider the Genius Loci of the area as much as possible. (Marsaki & Compositie 5 Stedenbouw, 2016)

## Water

One of the main ambitions of the Olmentuin was the carefully handling of the available water, use of water and the type of drainage of water such as rainwater and wastewater. The use of tap water can be diminished by using water saving toilet systems, taps and showers. Rainwater can also partly be used for the maintenance of gardens. Water buffering is a big opportunity in housing areas and provide for example green roofs, buffer capacities below terraces, buffer capacities under storage rooms, buffer capacities below parking lots and below the paving of sidewalks. Another possibility is the implementation of helophyte filters, implemented in the communal water area.

## Energy

This research is analysing possibilities to create a self-sufficient or ecologically sustainable neighbourhood by looking at previous implementations and innovations. One of the innovative ideas created for the energy theme is the Wooneco (Wooneco2) concept and will also implemented in the neighbourhood of the 'Olmentuin'. WoonEco2 is a model that rises from the initiative of Marsaki and Architecten Alliantie from Goes. The wooneco2 concept offers a sustainable solution for the demand of energy efficient living and working. The concept is based on the passive building concept.

The concept commenced when a new policy of the government was released. In 2020, the EPC calculations is going to be replaced by the BENG (Bijna Energie Neutraal Gebouw = almost energy neutral building). BENG is based on the concept of Trias Energetica and consists of three numbers:

1. Maximal energy demand in kWh/m<sup>2</sup> per year;
2. Maximal primary energy use in kWh/m<sup>2</sup> per year;
3. Minimal share in renewable energy in %.

Trias Energetica is the most applied strategy to incorporate energy-saving measures, so they can work in an efficient way. By being efficient Trias Energetica means to be as sustainable as possible, using as much renewable energy sources as possible. It does not only include environmental aspects, but also the financial aspects. Trias Energetica is also about becoming cost-effective: by taking energy-saving measures, money is also saved. (Rijksdienst voor Ondernemend Nederland, 2013) It includes three steps;

4. Limit energy demand
5. Use energy from renewable sources
6. Use fossil fuels in an efficient way

The concept is based on the passive building calculations, the PHPP, which works with the same assumptions. Working with Trias Energetica also means that the new policy of the government is covered. There are two ways within the Wooneco concept to become climate neutral or NOM (Nul Op de Meter = Zero on the meter).

The first way Wooneco uses is the improvement of the house by isolating it better and making it air tighter than the current norm of the applicated building norm. An all-electric heat installation will then take care of the heat demand in the house. Subsequently, the roof will be completely filled with PV-panels to compensate the energy demand.

The disadvantage of this method is that the hull of the building won't become very sustainable while the building should have a lifespan of at least 50 years. Apart from that, the investments in the building's installations are high. The installations are mainly heating systems and solar panels for such a building. The lifetime of these components are only 15-25 years, which means that the maintenance costs are going to be relatively high.

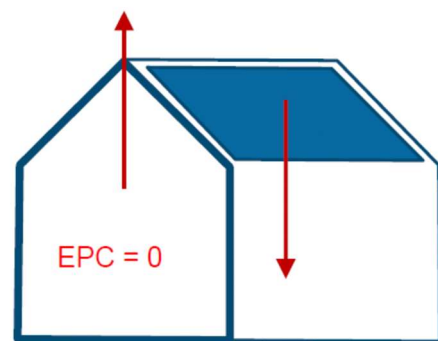


Figure 6 Visual view of the EPC of the first concept.

The second way Wooneco uses is the optimal orientation of the building, and focusing on good isolation and maximum airtightness. The minimum heat demand will then be achieved by installing an all-electric installation. Subsequently, the roof will be provided with a minimum number of PV-panels compensate the energy demand. By applying this way of becoming climate neutral or NOM, more investments are done to the hull of the house instead of the installations. Also, this offers opportunities to the renters to find other ways to reach the energy demand. Becoming climate neutral can be achieved by numerous measures such as implementing a pellet stove, infra-red panels, a sun-boiler system, a geothermal pump. This method creates a sustainable hull and the maintenance costs will also be lower.

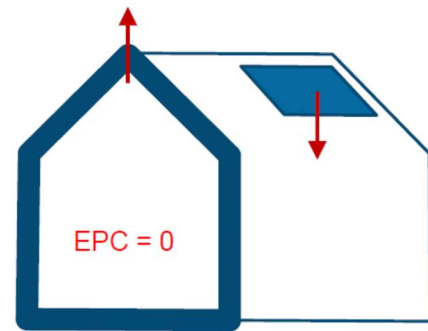


Figure 7 Visual view of the second concept.

The Wooneco2 building method is a proven building concept and has been applied in 2010 in Grijpskerke, which resulted in the first CO<sub>2</sub>-neutral neighbourhood in the Netherlands. This concept has then been used several times. The monitoring of the houses on energy and social subjects has proven that the houses are fulfilling their assumptions abundantly. They reach the goal of the low energy use and give the inhabitants a living environment that is very comfortable.

Wooneco2 uses the methodology of the 'passive house', where getting a certification is not a goal but only a possibility. The emphasis lies on the heavily isolated hull (RC (heat resistance) between 8 and 10 and frames with triple glass with a U-value of 0,8) and a high amount of gap and airtightness of the hull ( $Q_{v10} < 0,15$ ). The warmth loss will then be minimal and extra heating is therefore not necessary. Furthermore, there will be an optimal use of passive solar heat gain. This results in the installation using simple techniques and being easy to maintain.

The main goal of Wooneco is to become climate neutral to NOM. In this concept, the houses have a standard small boiler and have the option to become 'all-electric' by implementing a geothermal pump and PV panels can be implemented on the roof to get the desired electricity results. The houses don't only compensate the building legitimate energy use, but also the user's legitimate energy use. The EPC-calculation of a Wooneco is lower than 0.

A wooneco2 building also uses sustainable energy and compensation is occurring for the fossil fuel use. This adds up to the concept of Trias Energetica, which has been explained earlier in the theoretical framework. The theory of the wooneco2 will be used and applied in the creation of an eco-neighbourhood and is a handy tool to tackle the problem of energy usage. Wooneco2 builds further on the concept of Trias Energetica. Interviews with Patrick Harting have explained more of the model and how to apply to different neighbourhoods. (Marsaki, 2017) (Harting, 2012)

## Urbanism

The urban plan has a few important assumptions and implementations that are of relevance to this research and might be good opportunities.

- The houses are oriented towards the sun with the roof and will have solar panels.
- All houses are developed as lifecycle houses and energy neutral.
- The houses have a natural appearance with additional colour and material use.
- The communal garden will have a meeting place and will be designed as an edible park.
- House boundaries can only be natural.

The ambition is to create a healthy living environment within a building. The most important health aspects are:

- Prevent any annoying noise;
- Air and light quality;
- And visual comfort.

A lot of aspects are related to these three subjects such as the effect on health, perceived health and the well-being of an inhabitant. Additional measures are the low-temperature walls and heated floors, which will prevent dust accumulation. By applying balanced ventilation, the risk of contaminated air by filtration will be avoided.

## **Environment**

Not just water is of great relevance to the Olmentuin, when looking at the ecology. Houses are not seen as self-contained object in the project area, but they are seen as an organic whole with gardens and direct living environments. This is called the 'ecological housing approach'. The individual houses are in this concept seen as an integrated whole and must have added value for the public space. The roofs need to contain enough vegetation, shade should be contained as much as possible through natural vegetation such as fruit trees. (Marsaki & Compositie 5 Stedenbouw, 2016)

## **Participation**

Part of the participation theme in this neighbourhood is the fact the inhabitants are maintaining and managing the communal garden together. The green, water and streets will be maintained by the inhabitants. The communal greenhouses will also be an area where people can come together will be maintained and managed by these people. By using such as policy, which comes back in Lanxmeer as well, a socially sustainable neighbourhood starts to rise. This highlights the importance of social cohesion once more.

When having good social cohesion, the inhabitants will take initiative to do the maintenance and managing themselves. These developments should stay as realistic as possible, which means the project shouldn't only consist of green initiatives but also to be an area that can easily be managed and makes the work easier for inhabitants. A few examples that include the managing and maintaining of the neighbourhood are included in this list:

- Picking apples within the biological food production in the Olmentuin
- Watering plants
- Pruning plants
- Manage subsidence in paths
- Organizing community activities
- Cleaning
- Wiping leaves
- Catering greenhouse
- Offering social help for transport, shopping, cleaning, day care
- Subject related help (Marsaki & Compositie 5 Stedenbouw, 2016)

## **Finance**

Resulting from this project plan, an average increase in house cost of 400 euros per m2 is expected. Further research still must be done to the exact orientation of buildings when the urban plan is designed.



## Process

The plan for the Olmentuin has not yet been finished but a good start has been made. In the process and followed procedure several steps still must be taken and could be of importance in the recommendations for the research's pilot project.

- Further research must be done to the possible pollution of the soil at the taxi company. A soil research will show what the level of pollution is and if sanitation is necessary.
- In the buildings of the taxi company possible presence of asbestos should be researched.
- The area close to the project area might have potential protected flora and fauna species. This will be made visible through a quick scan, which will show if any measures can be taken concerning this subject.
- The water test must be executed over the preliminary project plan to see what opportunities are present in the water storage capacity.
- The area has a moderate archaeological expectance pattern. Further research is needed to define the exact values.

## Conclusion

The conclusion from this researched report is that if the process is executed as it is defined in the project plan, it might end up being a renewed version of the neighbourhood implemented in Culemborg, previously researched. The Olmentuin can serve as a good exemplary project plan for the vision in Goes-Oost, since it has comparable idealistic approaches in for example water, communal gardens and energy use. (Hiltrud Pötz, 2012)

## Appendix 3.1 Interview Marleen Kaptein

22-3-2017 11:00-16:30

### Introduction

First, the purpose of this interview was to create a transcript and to label the most important aspects again, as it was done with the interview of Pierre Bleuzé. However, this interview ran for around five hours and means it to be not suitable to write out the whole interview. That is why the most important results and interesting facts relevant to the research are written out in this broad summary of the interview. The interview was held at location in Culemborg, at the home of Marleen Kaptein. The summary of the interview will be send back to Mrs. Kaptein to proof its reliability.

The interview started by introducing each other. Marleen explained that she had been working in theatre for about 20 years and this makes things very interesting. Her different background resulted in a different perspective of process thinking by seeing things in a more participatory approach, which will come to light later in this summary. She started at the TU Delft in 1988 to change her area of expertise. I showed the framework that include the different themes I am going to research and she thought it to be familiar and highlighted that the theme 'process' should also be included. The process shows that a schedule of requirements had to be created with a lot of professionals and possible inhabitants following the previously explained EVA-concepts. She also explained that the biggest profit in a neighbourhood is in the implementation of infrastructure, and not on the housing level. When looking at urbanism, the preconditions come a step before implementing the buildings. It is important to see the different themes as an integrated whole, they all work together. A bad example is happening in Almere, where people can buy their house and must create their infrastructure themselves.

A lot of examples are discussed about bad use of the project process by not implementing all the different disciplines. During the interview, it came forward how important it is to identify the Genius Loci of an area, to research the historical value an area offers. In Lanxmeer, they perfectly identified this Genius Loci and found that the river Lek once had a construction through the area.

I showed the neighbourhood and explained the essence of restructuring the area. I explained that all the buildings are going to be demolished and she agreed that this opens many opportunities. She explained that it is necessary to give future inhabitants emotions for the neighbourhood they are going to live in, so they are willing to invest in it. In the specific neighbourhood, it is important to keep the feeling of the neighbourhood and to create a good transition between the rest of the neighbourhood.

The rest of the interview is summarised by placing the relevant text into the catalogue that has been defined earlier in the research. Mrs. Kaptein gave a presentation about all the themes and processes that were developed in EVA-Lanxmeer and following this presentation, the catalogue creates a good overview and answers the most important questions. The process part will be added as a different paragraph.

## Themes

## Theory

### Participation

- Before the project even started, participation was an important theme in the process part. The involvement of future inhabitants was already happening at the preparation of the first urban design. Excursions had been held and three workshops were held, which resulted in the creation of the 'inhabitants book' that included the wishes and ideas of the future inhabitants.
- Overall participation was important and an overview was created for EVA-Lanxmeer. From the start of the project the future inhabitants had influence on the urban design, which led to the creation of the BEL in 1998. A housing need survey showed a wide range of diversity in types of houses. Also, they were given the authority to create the common courtyards.

### Urbanism & environment

- An important aspect implemented in the plan was permaculture according to Mrs. Kaptein. Permaculture has five important assumptions in EVA-Lanxmeer: A cooperation between human and nature, the importance of autonomy, recycling material, development of self-sufficient systems and the creation of circular cycles (comparison with Cradle to Cradle), the usage of sustainable water and energy sources, the improvement of the local food production. It is important to highlight that according to Mrs. Kaptein and the concept of permaculture, it does not just belong to one theme, but encompasses all themes and sees it as an integrated whole.
- The urban plan had been redefined several times and in the end included an area of 30 ha. 6 ha consisted of living space, 4,5 ha consisted of working space and 1,5 ha consisted of a combination of living and working. Furthermore, 4 ha was set out for the creation of a city farm that incorporated the permaculture principles.
- Mobility has been incorporated very strongly in EVA-Lanxmeer. 1 parking space per house and the use of 'Wheels for All' are examples: opportunities to rent houses.
- All the houses are accessible by car but it is not allowed to park your car in front of your house permanently. Parking lots are built at the borders of the neighbourhood.
- There are nearly no main roads and there are a lot of hiking and biking paths. This results in a lot of space for social contact and recreation.

Water	<ul style="list-style-type: none"> <li>• The restriction of paved areas resulted in a lot of green space, where water could be caught.</li> <li>• The catchment of rain water from roofs in several ponds.</li> <li>• The rain water on the streets lead to several ditches.</li> <li>• The separated purification of grey water (domestic water) and black water (toilet water): the creation of helophyte filters.</li> <li>• The black water should have led to the biogas installation, which was initially planned, but hasn't been executed in the end.</li> <li>• An overview of the integral water system will be included.</li> <li>• The cooperation between different water sector companies worked as followed:</li> <li>• <b>Vitens:</b> Responsible for grey water and black water, heat, building in the water retention area, ecological development of water win area.</li> <li>• <b>Waterschap Rivierenland:</b> retention capacity, change natural shores. Development and maintenance helophyte filters.</li> </ul>
Energy	<ul style="list-style-type: none"> <li>• Following the principles of the Trias Energetica concept, which has been described earlier in the research.</li> <li>• The application of this discipline lead to the cooperation of energy experts and resulted in the winning of warmth from pumped drink water.</li> <li>• At the time of project EVA-Lanxmeer, the average EPC was 1.2. The EPC of the EVA-Lanxmeer houses was at the time 0.6 and more innovation is possible now.</li> <li>• Optimal use of passive solar energy.</li> <li>• Low-temperature wall heater.</li> <li>• The creation of a low-temperature heat network.</li> <li>• The winning of heat from ventilation.</li> <li>• All the houses are provided with solar boilers.</li> <li>• The energy partly comes from PV cells and solar panels.</li> <li>• A detailed overview of the energy network will be added.</li> </ul>
Finance	Finance is not thoroughly discussed during this interview. The possibility of getting subsidies have been discussed.
Process	<p>There were several steps in the process included in the creation of the neighbourhood. There were five main development phases;</p> <ul style="list-style-type: none"> <li>• The initiative and development of the EVA-concept: 1993-1995</li> </ul>



- The co-production stage together with the municipality of Culemborg: 1996-2003
- The plan preparation phase, doing research to the location and the start of integral development of the urban design: 1996-1998
- Start of the building process, where 30% consisted of social houses: 1999
- Maintenance phase, where the importance of the BEL (Bewonersvereniging EVA-Lanxmeer) started to increase: 2000-now

Simply describing the development steps does not do the process EVA-Lanxmeer justice. For every theme and step they created frameworks and schemes that showed the importance of creating interdisciplinary and integrated approaches. They found out that it was not possible to create a neighbourhood of this kind, when there was no cooperation and cohesion within and between the different disciplines. The process of EVA-Lanxmeer highlights the integration of both bottom-up and top-down approaches to create a better continuation of the process with the different cooperating stakeholders in the development process. The most important stakeholders were the Province of Gelderland, BÜgelHajema, Econnis, Copijn tuin- en landschapsarchitecten Utrecht, Arcadis, C.O.R.E. International, Dijkoraad, GGR Gas, NUON, Novem, Vitens, Waterschap Rivierenland, Polderdistrict, Zuiveringsschap and AVRI.

## Conclusions

- The EVA-concept has been a success in practice. The goal to involve the inhabitants in the initial process of the project and to make them help shaping the sustainable living environment and giving them more authority has been achieved.
- The 'life style' of adults and children has become more sustainable and this can easily be demonstrated.
- The authority on neighbourhood level, lots and houses increases the involvement and quality of life.
- The neighbourhood stays attractive and the real estate value has stayed the same.

These are the most important results the neighbourhood has achieved according to Mrs. Kaptein. Furthermore, there are various success factors that could help a project. To create success a well-funded story must be created that shows clear ambitions and should make the owner enthusiastic, since ground acquisition is necessary to realise the initial ambitions. Then, a selection of good professionals is necessary that can and are willing to cooperate to the benefit of the project. A common goal should be set between the different disciplines to overcome possible problems and issues. While executing project management, it is important to observe your own responsibilities and leaving space for equality between different professions and future inhabitants. The importance of communication within the process should be highlighted

once more since this can be the most important success factor. Within the communication sector it is important to consider the inhabitants and users as professionals apart from the actual professionals. Before the start of the project, it is important to create clarity about what the level of participation is going to be and qualifying the inhabitant as collaborator. In the financial plan, it is important to incorporate room for cooperation and this also brings additional costs. Then, it should be highlighted that the inhabitants should get their responsibility when they are ready for it, and when they are able to carry the responsibilities. When people recognise the fact that more can be reached when combining disciplines together, it is possible to create neighbourhood with such a scale. These are the most important conclusion made from the interview with Mrs. Kaptein.

## Appendix 3.2 Interview Pierre Bleuzé

17-3-2017

Tijdens dit interview is gebruik gemaakt van het coderen van de tekst met de volgende labels per onderwerp (zie conceptual framework): participation, urbanism & environment, water, energy, finance en process.

Pedro: Mijn onderzoeksvraag luidt als volgt: Hoe kan ik de wijk in Goes-Oost, die op dit moment bestaat uit sociale huurwoningen, zelfvoorzienend maken?

Bleuzé: Is dat een bestaande wijk?

Pedro: Die wordt geherstructureerd, en ik moet gaan kijken wat de mogelijkheden zijn. Ik kijk naar alle Delta Management aspecten, kijkend naar stedenbouwkunde, landschap, energie, water en financiën. De woningen zijn op dit moment erg outdated. *Aanwijzen van Goes-Oost op de kaart.*

Bleuzé: Ja ik ken het wijkje wel, het zijn erg simpele huizen met twee verdiepingen.

Pedro: Dit is wat ik ga onderzoeken. Ik kijk verder ook nog naar participatie en de sociale cohesie binnen de wijk aangezien dit ook een erg belangrijk aspect is. De opbouw van mijn onderzoek bestaat uit het kijken naar casestudies, zoals de betreffende wijk in Culemborg.

Bleuzé: Ik heb nog een ander voorbeeld wat wellicht een relevant onderwerp zou kunnen zijn.

Pedro: Oké, ik ga bovendien op bezoek bij de wijk in Culemborg: EVA-Lanxmeer.

Bleuzé: Met wie heb je een afspraak in Culemborg?

Pedro: Ik heb een afspraak met Marleen Kaptein.

Bleuzé: Doe haar maar de hartelijke groeten, ik heb met haar samengewerkt en zij is tevens de initiatiefnemer. Zij weet erg veel van het project af.

Pedro: Verder kijk ik naar een straat in Grijskerke, waarbij alle huizen nul op de meter zijn geworden. Ik probeer het Wooneco concept toe te passen van Marsaki, wat gaat over het duurzaam bouwen. De laatste wijk die ik graag wil onderzoeken is een wijk in Almere, die nog gebouwd moet worden. Daarna wil ik een catalogus maken met de verschillende opties en die toepassen op Goes-Oost en hieruit een visie schrijven, beginnend met een masterplan.

Bleuzé: *Pakt een boek.* Ken jij dit boek? Het heet green-blue grids en ik ben hier coauteur van. Er staan ook veel voorbeelden van verschillende wijken in.

Pedro: Ik ken het boek zelf niet, zou erg interessant kunnen zijn voor mijn onderzoek. Dit is het hoofd framework, wat ik wil gebruiken om de wijk op te splitsen. Ik heb mijn onderzoek afgebakend en klimaat en beleid niet meegenomen, omdat klimaat adaptatie natuurlijk een toepassing is van de hele wijk. Dan kom ik bij mijn volgende vraag: Hoe bent u betrokken geraakt bij het project?

Bleuzé: Marleen was de initiatiefnemer en ik had destijds een bureau met een collega, en een idee is ontstaan voor een duurzame wijk. Culemborg was de beste locatie en de gemeente was erg geïnteresseerd. Samen met mensen en door middel van workshops is er samengewerkt. Daarna zijn we begonnen met het schrijven van verschillende stedenbouwkundige plannen, en

ontwerpen waren daarna gerealiseerd. Toen is het stap voor stap tot ontwikkeling gekomen. Er zijn clusters neergezet binnen Culemborg die allemaal door verschillende partijen samen zijn ontwikkeld. Het is niet één groot plan geweest. Er is een algemene lay-out ontworpen waar verschillende groepen invloed hadden. Er is een project groep opgericht, en iedereen die een idee had moest langskomen bij de project groep. Het was een soort front office, waarmee de plannen werden besproken. Deze personen hebben uiteindelijk een bouwvergunning gekregen en op het moment dat een stedenbouwkundig plan werd gemaakt was er al positieve reactie ontstaan. Er waren aparte eisen gesteld aan wat er gedaan mocht voor het creëren van de wijk. **Het was een soort omgevingswet avant la lettre.** Het plan loopt nu op dit moment nog steeds en de ontwikkelingen gaan natuurlijk ook door. **Het leuke is als je naar het water plan kijkt, dat er in de woningen een gescheiden riool aangelegd moest worden. Het zwart water had bepaalde voedingsstoffen die mogelijke schade konden aanrichten aan het grondwater.** Er is ook ruimte gemaakt om later mogelijk een biogas installatie te ontwikkelen wat helaas uiteindelijk niet door is gegaan, maar daar is wel alles op voorbereid. Al die plannen moesten op dit soort dingen getoetst worden. Dit kostte natuurlijk ook extra geld en moest van tevoren dichtgetimmerd worden. **Een ander interessant aspect was de mandeligheid. Als je de opzet bekijkt van EVA-Lanxmeer, zie je dat er gemeenschappelijk groen aanwezig is. Bij elke woning moest je een extra bedrag betalen, waarvan een deel bijdrage aan de projectgroep en een deel voor het beheer van gemeenschappelijk groen. Dit is onderdeel van het participatie onderwerp. Het is bovendien belangrijk dat dit van tevoren goed wordt geregeld. Als dit niet goed is geregeld dan kan dit grote problemen veroorzaken op de sociale cohesie binnen een wijk.**

Pedro: Juist. Wat was uw rol binnen de ontwikkeling van het project?

Bleuzé: Ik heb meegedaan in de werkgroepen van **het water aspect, door alternatieven te bedenken met verschillende deskundigen.** Op den duur, ben ik betrokken geraakt bij het woningbouwproject. **Dit was het eerste collectieve particuliere bouwproject van Nederland, waarbij we zelf de opdrachtgever waren. Dit was dus ook een participatieproces. Ik heb daar dus verschillende rollen gehad.** Daarna is dit in uitvoering gegaan en heb ik verder niet meer naar het wateraspect.

Pedro: Dan over het water. Er wordt natuurlijk veel gebruik gemaakt van water, is het opvangen van regenwater succesvol geworden? Aangezien het opvangen van regenwater overal gedaan kan worden.

Bleuzé: **Voor zover ik weet wel. Er zijn wel wat water problemen geweest. We hebben problemen in de lift put, wat uiteindelijk een stedenbouwkundige fout is geweest. Toen is er ook heel erg gekeken naar of de woningen op de juiste plek zijn neergezet. Er is geconstateerd dat de grondwaterstand hoger stond dan initieel was besloten. Er mocht bovendien niet op palen gebouwd worden, aangezien het een water win gebied is. Zoekt de kaart op. Dit is het water win gebied. Er mag niet met palen gefundeerd worden omdat je anders door het grondwater prikt. Het duurt 25 jaar voor het grondwaterstand om zich zelf te ontwikkelen. Als er op palen gebouwd werd, kon je het grondwater niet meer gebruiken als drinkwater. Daarnaast is er gebruik gemaakt van grijswater, er is geconstateerd dat daar veel voedingsstoffen inzaten maar dat het toch geschikt was om te lozen. Het was uiteindelijk succesvol. Verder was er een seizoen berging, in de vorm van een vijver.**

Pedro: Dit was dus eigenlijk een soort van centrale water opslag plek?

Bleuzé: Ja. **Dit werd dan gebruikt om het oppervlaktewater in de wijk te voeden.**

Pedro: Heeft EVA-Lanxmeer een eigen drinkwaternet opgezet?



Bleuzé: Nee. Het drinkwater werd gewoon vanuit de centrale pomp geregeld op het officiële net. Wat wel interessant is het combineren van water en energie. Als je drinkwater uit de bodem onttrekt, dan krijg je water van een bepaalde temperatuur. Hier zet je dus een warmtepomp neer. Het drinkwater verlaag je dan in temperatuur met een paar graden. Dat doe je door bijvoorbeeld 10 kuub 2 graden in temperatuur te verlagen, waardoor je 1 kuub met 20 graden kunt verwarmen. Het is dus een kwestie van volumes.

Pedro: In Grijskerke hebben ze blijkbaar ook van die warmtepompen. Er waren wat problemen met het lawaai dat een warmtepomp.

Bleuzé: Je kan bovendien ook buitenlucht energie opwekken. In Duitsland heb je een warmtepomp buiten naast je huis staan en die onttrekt warmte uit de buitenlucht. En dan kan je het van lucht ook omzetten in water. Het werkt hetzelfde als een koelkast. Een koelkast onttrekt koude lucht. Een huis is dus een koelkast maar dan omgekeerd. Belangrijk is dus om alle omgevingswarme te gebruiken. Onzekerheden zijn de fluctuerende temperaturen. Dit is goed te overwegen omdat dit zeer toepasselijk is op klein niveau.

Pedro: Om een goede wijk te bouwen denk ik dat je bij het herstructureer proces ook moet kijken naar verschillende typen woningen.

Bleuzé: Ja, dit is inderdaad ook zeker waar. Je kunt ook de daken van de huizen op de goede manier situeren. Het belangrijkste is dat de technieken er al zijn. De vraag is, hoe krijg je de mensen zo ver? Kijk even bij een ander project: Hof van Heden in Hoogvliet. Het is een mengvorm van appartementen en rijtjeswoningen, waarvan een deel koop en een deel sociaal. Er zitten gemeenschappelijke voorzieningen in en dus ook gemeenschappelijk groengebied. Die mensen hebben voor ons gekozen omdat het project in Culemborg ook succesvol was. Samen hebben we de uitgangspunten gemaakt en gekozen voor een verschil in koop en huurwoningen gemaakt. Een deel zou dus ook gemeenschappelijk gemaakt worden. Daar zit dus het grote risico in, als het niet lukt faalt je hele project. Als je kiest voor geen gemeenschappelijk groen, is alles goed georganiseerd alleen mis je dan wel de sociale cohesie die je dus wilt creëren binnen een wijk. Er is ambitie en risico. Een gemeenschappelijke ruimte is duurder dan een huis en moet dus gefinancierd worden.

Pedro: De volgende vraag is dan ook, hoe selecteer je de mensen die in je wijk gaan wonen?

Bleuzé: Een aantal zaten er vanaf het begin bij en kregen een voorrangpositie. Er is niemand teruggekomen van de mensen die daar woonden omdat dit echt het onderste van de markt was. De huurwoningen waren zo verkocht maar de koopwoningen duurden langer. Mensen moesten echt meedoen om een wijk als deze te ontwikkelen. Er zijn veel meetings geweest waarin plannen gemaakt werden. Dit was echt een voorwaarde omdat de mensen er anders geen gevoel bij krijgen. Als je zomaar een woning geeft met gemeenschappelijke ruimte gaat het helemaal niet werken. Je moet kijken naar de participatie ladder en je moet de mensen eerst empoweren. Op den duur draag ik de verantwoordelijkheid als corporatie aan jou en moet alles dus goed georganiseerd worden. Hier hebben we dus een VVE. Verschillende partijen hebben dus andere belangen binnen het project. Niet iedereen zit op een gelijke manier aan tafel. Het was beter geweest als Vestia had gezegd, maar we trekken ons terug voor het gemeenschappelijk gebied.

Pedro: Je moet duidelijk maken aan de bewoners wat er moet gebeuren binnen een wijk.

Bleuzé: Precies. Je bent dan bezig met het gebied maar heel een gemeenschappelijk gebied moet nog opgezet worden en het duurt lang voordat er eindelijk minder onderhoud aan is. Het duurt lang voordat het op een gezet niveau komt. We zijn daarna aan de slag gegaan met een hovenier en die heeft samen met ons een beheersplan gemaakt die periodiek met bewoners aan de slag

ging in de weekenden. Niet elke bewoner heeft genoeg ervaring om een gemeenschappelijk gebied te kunnen beheren. Er waren dus een soort van cursussen gedaan waardoor de bewoners er meer vanaf kwamen te weten en het project dus meer kans van slagen had. Het water wordt bovendien opgevangen en opgeslagen in binnen terrein. Een wadi en vijver waren hiervoor de oplossing. Het opvangen van water in een gemeenschappelijk groen gebied is een ideaal aspect, omdat dit bijdraagt aan de leefomgeving en dus een win-win situatie veroorzaakt. Je moet echt kunnen faciliteren dat de mensen mogelijkheden krijgen om mee te doen in de participatie. Problemen kunnen zijn dat mensen niet mee willen doen of niet kunnen samenwerken met andere mensen. Als ik zo jou verhaal hoor, is de participatie een van de belangrijkste aspecten binnen je project, meer nog dan de technische aspecten in het project. Als het allemaal dingen zijn met een 'stekker', dan doe je het of je doet het niet. Als je een plan gaat maken, moet je net zo goed participatie meenemen als dat je harde structuren gaat ontwikkelen. Als de bewoner zegt, wij vinden dat het zo moet, of je dan ook niet zo een inzicht moet volgen, als dat uiteindelijk zorgt dat het beter gaat functioneren.

Pedro: Het is leuk dat je dit zegt omdat dit in Goes-West ook door Marsaki gedaan.

Bleuzé: Je moet hier trouwens wel voorzichtig mee zijn, omdat de meest woeste ideeën zijn ontstaan. Alleen moet je die plannen op de grond weten te zetten. Het probleem is dat die mensen denken dat alles kan, alleen moet iets wel realistisch blijven. Het beste idee is dus dat je de mensen goede ambities laat maken maar dus wel bepaalde eisen stelt aan hun ideeën zodat het ook realistisch blijft. Ik denk dat dat een betere manier is, omdat je anders al hun leuke dingen weg moet gaan halen. Je moet mensen voorbeeldprojecten laten zien, die binnen de dezelfde contouren zitten. Hiermee laat je zien wat ongeveer haalbaar is. Dan ben je meer met de ingrediënten aan het spelen, in plaats van dat de ideeën te uiteenlopend worden.

Pedro: *Laat kaart zien van Goes-Oost.*

Bleuzé: Moet er hetzelfde aantal woningen terugkomen?

Pedro: Nee, ze willen verdunnen.

Bleuzé: Je kunt dus kijken naar het breder maken van de type woningen. Dus bijvoorbeeld het bouwen van appartementen, heb je dus mogelijkheden voor de oudere mensen om hierin te wonen. Deze partijen kun je dus ook betrekken in je project. Door jonge gezinnen ook te laten terugkomen, krijg je een betere sociale cohesie. Het is dus denk ik voor jou bijna niet mogelijk om de mensen te laten terugkomen. Is er al contact met verschillende initiatiefgroepen in Goes?

Pedro: Nee.

Bleuzé: Je zou misschien kunnen kijken naar initiatiefgroepen binnen Goes of Zeeland en of die mogelijk interesse hebben naar het creëren van een betreffende wijk in Goes-Oost.

Pedro: Dit is zeker een mogelijkheid, alleen heb ik helaas nog maar weinig tijd om mijn afstudeeropdracht af te ronden.

Bleuzé: Je kunt wellicht inventariseren of er draagvlak is, alleen heb je natuurlijk allang je onderzoeksvoorstel af, alleen kan je altijd wat veranderen aan je methode. Heb je nu een beetje genoeg informatie van mij eigenlijk?

Pedro: Ja! Ik denk dat ik veel te weten ben gekomen. Ik denk ook dat ik nu pas weet hoe belangrijk de sociale cohesie binnen een wijk is.

Bleuzé: Ja, participatie is niet iets wat zomaar ontstaat. Goed, ik hoop dat je veel hebt gehad aan dit gesprek en ik zie je bij de terugkomdag op 12 april. Als er nog iets is en als je nog hulp nodig hebt, kun je me altijd bereiken.

Pedro: Hartelijk bedankt voor uw tijd en gastvrijheid en ik wens u een fijn weekend.

## Conclusion

Criteria	Theory
Participation	<p>The neighbourhood of EVA-Lanxmeer made use of common green space. While buying a home or renting one, they agreed to buying a part of the common green space and contributing to the management of these areas. This increases the chance of success and enhances the participation of the inhabitants. There was a high importance of making social cohesion work, since this could have had a bad influence on the realization and management of the project. According to Pierre Bleuzé, EVA-Lanxmeer was the first collective private building project.</p> <p>Participation can make or break a project. If the project is not using social cohesion as a pillar, it will most likely fail. This is a big risk to take. For example, the decision should be taken between common green space and organized gardens and borders. Participation includes both ambition and risks. It is important to make sure that future inhabitants will get 'emotions' with the neighbourhood and are willing to invest their time and money in it. Possibilities to do this are conducting of workshops, setting realistic goals, giving courses and including them in the process. It is important to look at the participation ladder, by first empowering the people, and in the end giving the inhabitants their own responsibility and having enough knowledge.</p>
Urbanism & environment	<p>Pierre Bleuzé is also talking about another neighbourhood in this project. This will be added to the case study research and is called 'Hof van Heden' in Hoogvliet. He is starting to talk about this project since it included a participatory approach while choosing a different range of house sizes. The project consists of social houses, apartments and houses for sale. They chose for this structure since it enhances the social capacity within the neighbourhood. The urban plan in this neighbourhood also consists of public green space, which enhances the quality of life. A small pond also always increases the quality of the living environment and has multiple potential uses..</p> <p>Also, in Culemborg the board made the decision to diversify the typology of houses by incorporating apartments, terraced</p>

	houses and villa's. EVA-Lanxmeer had the restriction of building on pillars, since it was located in a water-win area.
Water	The water plan of EVA-Lanxmeer was one of the most innovative projects and they built a consistent renewable system. They collect the black water, they created a separate sewage system. The drink water is coming from the central installation. Also, a seasonal storage pond is present in the centre of the neighbourhood. This pond varies in height depending on the season. Furthermore, if one subtracts water from the surface, the water gains a certain temperature. That is where water can be combined with energy winning.
Energy	<p>The water subtracted from the surface gains a certain temperature and therefore brings energy. This energy can be contained by installing a heat pump. The heat pump will decrease the obtained water and this releases a lot of energy. For example, by lowering 10 cubic litres of water with 2 degrees, one is able to increase 1 cubic litre of water with 20 degrees. This is a very suitable technique used in nearly every house in EVA-Lanxmeer.</p> <p>Also, it is possible to subtract energy from the open air. This is a widely-used source of energy in Germany, where a heat pump is situated next to the house and subtracts warm energy from the warm air. It is important to use all surrounding heat that could complement each other. This brings certainties in the form of fluctuating outside temperatures and this might bring problems to the heat pumps.</p>
Finance	The financial aspect has mostly been excluded from this interview.



## Appendix 3.3 Interview Patrick Harting

7-4-2017

**Tijdens dit interview is gebruik gemaakt van het coderen van de tekst met de volgende labels per onderwerp (zie conceptual framework):** participation, urbanism & environment, water, energy, finance en process.

Pedro: Goeiemorgen Patrick, ik begin maar gelijk goed aangezien je het behoorlijk druk hebt: Ben je bekend met mijn afstudeeronderzoek?

Patrick: Ja, ik heb er wel wat over gehoord maar weet niet precies wat je aan het doen bent.

Pedro: Ik doe een onderzoek met als hoofdvraag: Hoe kan ik een wijk in Goes-Oost, de Verzetsheldenbuurt, zelfvoorzienend maken? En wat zijn daar de mogelijkheden voor? Nu is het zo dat op basis van mijn onderzoek ik niet meer zo specifiek kijk naar het echt zelfvoorzienend maken aangezien dit lastig blijkt te zijn en niet alles kan worden meegenomen in Goes-Oost, en dit is uiteraard ook een deel van mijn resultaten. Ik focus op een paar belangrijke thema's en energie is er hier 1 van, daarmee kom ik op het Wooneco concept.

Patrick: Klinkt heel interessant.

Pedro: Dan is mijn volgende vraag: Hoe is het Wooneco tot stand gekomen en wat zijn hier de principes van?

Patrick: Het Wooneco concept is ontstaan uit de vraag naar duurzaamheid in de toekomst en het ontstaan van nieuwe eisen binnen de overheid, genaamd de BENG-principes.

Nieuwbouwwoningen die na 2020 worden opgeleverd moeten bijna energieneutraal zijn. Wie niet aan die eis voldoet, mag zijn projecten straks niet meer realiseren. Bouwpartijen moeten daarom op een andere manier gaan ontwikkelen, ontwerpen, bouwen en opleveren. BENG staat dus voor Bijna Energie Neutraal Gebouw. In BENG wordt energieprestatie van een gebouw uitgedrukt met drie indicatoren: De energiebehoefte van het gebouw, het primair fossiele energiegebruik en het aandeel hernieuwbare energie.

Pedro: Wat voor opties zijn er binnen Wooneco om een woning energie neutraal te maken en wat voor innovatie is er nog steeds bezig op dit gebied?

Patrick: Op dit moment is men erg hard bezig om een soort batterij te ontwikkelen die overmatig energie opslaat. Dit zou zelfs mogelijk kunnen zijn op wijkniveau, en is daarom een mogelijke onderzoek idee voor jou. Denk bijvoorbeeld aan de Power Wall van Tesla. Deze is alleen op financieel gebied niet heel haalbaar voor sociale huurwoningen maar bied wel zeer veel mogelijkheden. Verder focust het Wooneco concept zich eerst op het verduurzamen van het casco waardoor een huis 50-100 jaar kan blijven staan en daarmee voldoet aan de BENG eisen.

Pedro: Is er een rapport over Wooneco?

Patrick: Ja, er is een visie geschreven over het Wooneco concept en zal dit naar je toe sturen. Om terug te komen op de catalogus, zonne-energie is op Zeeland heel erg toepasbaar omdat Zeeland zelf de meeste zonuren van Nederland heeft. Dus het opslaan van je zonne-energie in batterijen is in opkomst maar moet nog verder uitgewerkt worden.

Pedro: Dan gaan we even verder. Ik zal je even vertellen wat ik eigenlijk aan het doen ben nu. Ik maak een catalogus die kijkt naar alle opties in het algemeen en alle thema's aanpak die ik meeneem. Dan moet ik dus ook een beetje naar financiële haalbaarheid kijken en daar past een batterij op dit moment nog niet helemaal in.

Patrick: Nou, dat ben ik toch niet helemaal met je eens. Dit is namelijk de Tesla batterij en is een erg luxe product. Je kan dus zeggen dat je voor een wijkbatterij gaat. Je kan om de tafel met een energieleverancier die samen een wijkbatterij financieren. Daar kunnen mensen hun energie in opslaan, en kan mogelijk worden gekeken naar de financiën omdat de energieleverancier problemen heeft met het bufferen van de duurzame energie in het net. Er zijn dus meerdere oplossingen.

Pedro: Zou het dan bijvoorbeeld mogelijk kunnen zijn dat je energie kunt uitwisselen door middel van het onderverdelen van energie over verschillende huizen waar mogelijk, zodat je eigenlijk los bent van het net.

Patrick: Je zou bijvoorbeeld ook kunnen zeggen dat de batterij in het bezit komt van corporatie, die daarmee zijn huurders kan gaan helpen. Je zegt misschien net iets te snel dat iets niet mogelijk is. Ik zie bijvoorbeeld ook dat je water hebt staan en daar kan je dus als er een kleine vijver is ergens ook al gelijk een heleboel mee, als er ruimte voor is. Ik merk aan wat je tot nu toe allemaal hebt verteld dat de Olmetuin een goed voorbeeldproject voor jou is en waar je wellicht verder onderzoek naar zou kunnen doen. Ik zal je hierover ook nog wat relevante informatie sturen.

Pedro: Is er verder een soort catalogus beschikbaar die laat zien wat de mogelijkheden zijn binnen het Wooneco concept?

Patrick: Ja, dat staat in het visiedocument van Wooneco dat ik je ga opsturen.

Pedro: Verder ben ik tijdens mijn onderzoek naar Culemborg geweest, de wijk EVA-Lanxmeer en daar baseer ik deels ook mijn onderzoek op.

Patrick: Oh ja! Wat leuk, die wijk ken ik wel ja. Erg goed voorbeeld. Dan is de Olmetuin voor jou al helemaal een mooi voorbeeld, want dit project was eigenlijk een verbeterde versie van het project Lanxmeer in Culemborg. Ik ben daar weleens geweest met Rens Peijnenburg, de groene kaboutervormer zoals we hem noemden. Wij hebben er toen voor gekozen om niet zozeer te kijken naar de ecologische kant, maar meer te kijken naar de energetische kant van het duurzaam bouwen. We proberen nu daarom de ecologische er een beetje bij te trekken en jouw onderzoek is daarom zeer relevant. Wij proberen bijvoorbeeld nu te kijken naar het creëren van gemeenschappelijke kassen voor het verbouwen van voedsel. Ook kijken we naar het water aspect en het implementeren van helofyten filters voor het reinigen van het afvalwater. Bovendien ook wadi's. Er is verder ook nog een project genaamd C4G4. Dit project wordt ook wel de Brabantwoning genoemd maar is helaas nooit uitgevoerd.

Pedro: Waar was dit project op gefocust?

Patrick: C4G4 Halsteren. Het is al een project dat een flinke tijd geleden is gemaakt, daterend uit 2010. Het is zeker relevant voor jou onderzoek want het was toen al erg vooruitstrevend. De provincie had bedacht om samen met vier gemeenten en corporaties de meest duurzame woning van Noord-Brabant te creëren. Dit moest fungeren als een soort voorbeeld voor de woningen in Brabant. Er is een groep gevormd waar wij toen namens Castria fungeerden, en hebben een woning gerealiseerd. Uiteindelijk is er helaas maar één locatie gerealiseerd. Deze woningen waren niet alleen energiezuinig maar ecologisch erg duurzaam. Denk daar bijvoorbeeld aan het groene daken en wadi's in de tuin met de opvang van regenwater. De Olmetuin is uiteindelijk een soort samenvatting van De Brabantwoning, externe kennis en misschien ook wel een beetje kennis van Lanxmeer.

Pedro: Verder in mijn onderzoek kijk ik ook voor een gedeelte naar het financiële aspect. Met het wooneco concept, is daar iets over bekend en is er een soort catalogus met de extra kosten die de woning maakt?

Patrick: Ja, gemiddeld ongeveer 20.000 euro duurder dan een EPC van 0.4.

Pedro: Zijn er ook specifieke getallen beschikbaar die naar elk maatregel kijken?

Patrick: Uhm, je kan kijken in de presentatiemap waar grove bedragen in staan die je kunt gebruiken voor je begroting. Waar je ook in kunt kijken is het bestand van de cataloguswoningen van RWS, waar ook grove bedragen in staan die van relevantie zijn voor jou project.

Pedro: Zijn er verder nog subsidies mogelijk?

Patrick: Op dit moment krijg je vooral op het implementeren van bodem warmte pompen subsidies. Je moet het zien als dat Wooneco eigenlijk een middel is om je woonlasten te beheersen. Het stukje dat normaal gesproken onbekend is in je woonlasten gebruik is je energieverbruik. Je weet namelijk hoeveel huur je moet betalen etc. Maar je hebt geen grip op je energie. Omdat je met een Wooneco woning zelf je energie opwekt kun je dus je woonlasten beheersen en ben je toekomst proof. Het grote voordeel van Wooneco is dat je energieverbruik veel lager ligt door goede isolatie en daardoor de risico's ook lager liggen.

Pedro: Ik heb wel gelezen dat er een groot risico is in toepassen van het Wooneco concept en dat de isolatie van de woningen wel risico's met zich meebrengt.

Patrick: Ja, je moet zeer goeie zonwering hebben anders werkt het eigenlijk kokend. Als je de zonwering goed gebruikt, wordt het binnen alleen eigenlijk nog beter dan dat het eerst was.

Pedro: Nou, ik denk dat ik hiermee al een stuk verder kan, en heb genoeg leesvoer. Misschien kunnen we samen ook een keer kijken naar de opties binnen Goes-Oost.

Patrick: Ja, als je vragen hebt kun je altijd bij me terecht. Ik hoop dat alles gaat lukken en ik vind het een erg leuk onderwerp van je. Succes verder met je onderzoek! Het is een erg relevant onderzoek aangezien er nog uitwerking mist in het integraal ontwerpen van zo een wijk.

Pedro: Bedankt en succes met werken nog vandaag.

### Verkregen document:

Wooneco Visie

Olmentuin Projectvisie

### Conclusion

Criteria	Theory
Participation	In the interview, it comes forward that Patrick Harting also agrees that participation is an important subject in the creation of a sustainable neighbourhood. In his example project 'Olmentuin' in Steenberg, the importance of social cohesion and participation is also highlighted and social sustainability is even seen as a separate implementation term.
Urbanism & environment	During the interview, there was not a lot of discussion about the urban plans of neighbourhoods. However, the environment is

	highlighted in the form of water and public green space. Also, Patrick says that the inclusion of ecological sustainability instead of just the energetics is important.
Water	Patrick states that water should be included in all eco-neighbourhoods and mentions a few of the most implemented water measures. Helophyte filters is one of the examples where water purification takes place and is suitable. Also, he states that wadis are a widely-used measure to drain rain water disconnected from the water net. This also enhances the living environment within the neighbourhood. He states the importance of water and the importance of disconnecting water from the official sewerage.
Energy	<p>Energy was the most important point of discussion in this interview. The Wooneco concept was the mostly discussed subject and will most likely be applied to the vision in this project. First, the newly developed BENG (almost energy neutral buildings) report from the government was highlighted. This is also where the Wooneco concept derives from and will be considered during this research. The BENG principles are expressed in three indicators: The energy demand of the building, the primary fossil fuel use and the share of renewable energy.</p> <p>The Wooneco concept focuses itself mostly on the preservation of the hull of the building. The Wooneco concept needs to be further researched and might be very suitable for the energy part of this thesis.</p> <p>The last part included is the power wall. This is a battery that can store the energy obtained from renewable energy sources and is able to distribute this when necessary. This brings an opportunity on neighbourhood level, where houses can exchange their energy where possible.</p>
Finance	This is the first interview that also included the financial theme. Patrick says that each house, if it wants to achieve the BENG-norm and if it wants to implement the Wooneco-concept, will be around 20.000 euros more expensive relative to houses with an EPC of 0.4.



He also provided met with options to look for more detailed information about specific costs of certain measures and this needs further research.

Also, there are possibilities to get subsidies when implementing a geothermal pump, focused on heat and warmth.

Process

The importance of the process theme is once more highlighted during this interview. It is highlighted in the form of stakeholder involvement. Opportunities must be researched as to how the stakeholders can be involved.

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## Appendix 4 ‘Eco-neighbourhood catalogue’

### WATER



The integrated use of water has proven to be of great importance in new urban developments, especially in the densely-populated country of the Netherlands. (Gemeente Culemborg and Stichting EVA, 1998) The theme has close cooperation with the energy theme and enhances quality of life in an area. The options are:

- The catchment of rain water from building roofs.
- Helophyte filters; The separated purification of grey water and black water.
- Above ground precipitation drains and buffers: This combines many types of precipitation catchment and can be combined with a water playground for children and raises awareness of conscious water drainage for inhabitants.
- Fluted gutters;
- Buffering and infiltration: restriction of the amount of paved areas results in extension of green space, where water can be captured. Rainwater buffering facilities can be realised by reducing the proportion of hard surface areas.
- Wadi's;
- Wetlands;
- Rainwater ponds;
- Seasonal storage;
- Nature friendly bioswales are wadi's including more vegetation;
- Separation of water network, creating your own water network.
- The application of these measures offers opportunities to disconnect from the drainage system.
- Rain ton in homes.

#### Risks

Water often includes various nutrients that can't be purified by the natural systems, and could lead to wrong filtration. Furthermore, the catchment of water uses a significant amount of the project area's surface and can therefore be implemented when enough space is available.

### ENERGY



Energy supply is essential and a broad neighbourhood approach is more efficient than looking at individual housing. A separation is made between collective energy use and individual energy use.

#### Individual

One of the innovative ideas created for the energy theme is the Wooneco (Wooneco2) concept and is implemented in the neighbourhood of the 'Olmentuin'. WoonEco2 is a model that rises from the initiative of Marsaki and Architecten Alliantie from Goes. The wooneco2 concept offers a sustainable solution for the demand of energy efficient living and working. The concept is based on the passive building concept and following the concept of Trias Energetica. See appendix 4 for a detailed description of the measures and results of the energy theme. The most important options include:

- The most used and suitable implementation in several projects is the geothermal pump;
- Optimal use of passive solar energy;
- Low-temperature wall heater;

- The creation of a low-temperature heat network;
- The winning of heat from ventilation;
- Energy storage battery;
- Small-scale wind energy.

The main goal of the Wooneco concept, which is most likely to be implemented in this pilot project, is to become climate neutral to NOM. In this concept, the houses have a standard small boiler and have the option to become 'all-electric' by implementing a geothermal pump. Also, PV panels can be implemented on the roof to get the desired electricity results. The houses don't only compensate the building's legitimate energy use, but also the user's legitimate energy use. The EPC-calculation of a Wooneco is lower than 0 and fulfilling the demands of the BENG principles.

### Collective

The other way to look at energy use, supply and demand within a neighbourhood is about collective energy use. The examples are:

- Collective energy network;
- Share heat with neighbours;
- Involving electric cars.

Collective energy networks are still in a development phase but might offer long-term solutions (appendix 4).

### Risks

An important factor at reducing energy is to not lose the main goal of building a new house, which is about giving the inhabitant perfect comfort. All the implemented measures to reduce the energy use should not conflict with the inhabitant's comfort. Think for example of noise, air and light quality and visual comfort.

## URBANISM



The goal of urbanism in an eco-neighbourhood is to create a vivid integration of urban, natural and agricultural elements and functions. This theme closely cooperates with the environment theme since urbanism and environment should be an integrated whole according to the interview with Mrs. Kaptein (appendix 3.1). There are several aspects included in urbanism;

- **Mobility:** Using shared rental cars, the placement of parking lots out of sight and decreasing the parking space rate are options. Also, there is the option to create a car free zone as is incorporated in EVA-Lanxmeer. Inhabitants are only allowed inside to load and unload. Also, the importance of changing the infrastructure should be included.
- Diversity in housing types creates the best neighbourhood. The housing types include apartments, social housing and private housing as well as difference in size.
- The urban plan has the best atmosphere with good integration of public green space and small clusters of buildings to create enough 'air' in the neighbourhood.
- Eco-neighbourhoods often include small private gardens, connected to a communal garden. This enhances social cohesion in the neighbourhood and generates participation.
- Green roofs.

### Risks

The risk of a social oriented urban plan, is the possibility of failure in social cohesion, as a result from the small private gardens connected to a communal garden. When no social cohesion occurs, the urban plan is not successful and will result in the failure of the creation of an eco-neighbourhood, as is explained in the interviews with both Mrs. Kaptein and Pierre Bleuzé (Appendix 3.1 + 3.2).

## ENVIRONMENT



The environment of the neighbourhood is closely related to the Genius Loci of the project area. In the case studies, the cultural history is of great importance and comes back in the vision and design. A subject that comes back in the plan for EVA-Lanxmeer and Hof van Heden (appendix 3) is the implementation of the concept 'permaculture', which has been explained in previous chapters. The interview with Mrs. Kaptein (appendix 3.1) showed the most important principles for permaculture in a neighbourhood:

- A cooperation between human and nature;
- the importance of autonomy;
- recycling material;
- development of self-sufficient systems and the creation of circular cycles;
- the usage of sustainable water and energy sources;
- the improvement of the local food production by implementing fruit trees instead of normal trees.
- The creation of a natural border of private gardens instead of fences.
- Use of public greenery;
- Development of a communal kitchen garden, which can also serve as a meeting place;
- Processing garden waste;
- Green parking lots.

The permaculture concept should be running through the project plan and is of great importance and will enhance living environment, quality of life and social cohesion and participation.

### Risks

Great caution must be addressed to potential new inhabitants, since creating for example natural garden borders, impacts the level of privacy in a neighbourhood. The inhabitants need to know this before they are willing to live in such an area.

## PARTICIPATION



Participation is the most vital theme to create an eco-neighbourhood. This is also the theme most project developers are likely to neglect since a top-down approach is often the easiest procedure. Participation enhances the social cohesion and creates integration between the other themes as is explained by Mrs. Kaptein (appendix 3.1). The most important steps and options for participation are described:

- The creation of a foundation of inhabitants that offer collaborating principles such as neighbour-help, doing shopping together, collaborating maintenance, insurances, health care and sharing materials.
- Participation from potential inhabitants should be incorporated from the start of the project and can include thinking along with vision structure and design.
- Excursions to existing eco-neighbourhoods with future inhabitants.



- The creation of communal gardens, where renters agree to buying a part of the communal garden, which enhances participation and the sense of attachment to the place.
- Implementing a shared car project, decreases emissions and pressure of cars in a neighbourhood and creates a participatory approach.
- Give the responsibility of maintenance of gardens to the inhabitants.
- Form working groups of different professionals and potential inhabitants that work on different themes such as the themes chosen for this research.

### Risks

Participation and social cohesion are fragile subjects and must be taken care of with great caution. As Pierre Bleuzé said in the interview: “participation can make or break a project” (appendix 3.2) (appendix 6.1). Proper research is needed to analyse and determine the demand for participation in a future neighbourhood and potential future inhabitants. Furthermore, previous pilot projects have proven to be successful when participation is executed on a small scale. The bigger a communal garden and more people are connected to it, the less the people will have a sense of feeling with it, and results in lack of maintenance.

## FINANCE

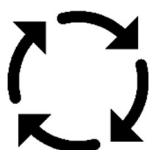


Previous case studies and desk research have shown that financial costs and benefits can be of great influence in an eco-neighbourhood. When creating a vision and analysing the options, the process should stay as realistic as possible. This means an option should stay within the financial boundaries, and when it exceeds this boundary should provide enough evidence of social and ecological benefits to overcome the financial negatives. Living sustainably and building sustainably offers several subsidy possibilities in the Netherlands. Think of subsidies on solar panels, wind energy or rainwater catchment. Some of these subsidies are taken care of on a national level. A lot of subsidies are dealt with locally, and are handled per municipality (appendix 6).

### Risks

It is often said that a cost-benefit analysis is merely an estimation of the financial influences and is therefore not real proof of the costs of a project. This brings a lot of uncertainties and is also the highest risk factor. Also, a cost-benefit analysis should include social benefits, which do not have a number and are not tangible.

## PROCESS



In the interview with Mrs. Kaptein, it is revealed that the process is of equal importance as people, planet and profit, as is described earlier (appendix 3.1). To generate a successful neighbourhood, a well-funded story must be created that shows clear ambitions and should make the owner enthusiastic, since ground acquisition is necessary to realise the initial ambitions. Then, a selection of skilled professionals is necessary that are willing to cooperate, which benefits the project. A common goal should be set between the different disciplines to overcome possible problems and issues. While executing project management, it is important to observe your own responsibilities and leaving space for equality between different professions and future inhabitants. The importance of communication

within the process should be highlighted once more since this can be the most important success factor (appendix 3).

When building an integral process, it is important to include the different interests and insights of the key stakeholders. The best way to do this is by making a process plan that includes all the different themes in each phase of the project, to create an integral and central approach, where all ambitions of the stakeholders are translated to their language of profession (Rijksdienst voor Ondernemend Nederland, 2012).

Within the communication sector it is important to consider the inhabitants and users as professionals by giving them a sense of influence, as has been incorporated in EVA-Lanxmeer successfully (appendix 3). Before the start of the project, it is important to create clarity about what the level of participation is going to be and qualifying the inhabitant as collator. In the financial plan, it is important to incorporate room for cooperation and this also brings additional costs. Then, it should be highlighted that the inhabitants should get their responsibility when they are ready for it, and when they are able to carry the responsibilities given. When people recognise the fact that more can be reached when combining disciplines together, it is possible to create an integrated, ecologically and sustainable neighbourhood.

## Appendix 5 ‘Desk research eco-neighbourhood’ catalogue’

A part of this bachelor thesis includes the research to relevant possibilities to implement in the eco-neighbourhood since not everything has been used in the case studies and continuous innovations are always happening. That is why this desk research has been done based on the predefined eco-neighbourhood themes to encompass a wider area of possibilities. The themes, that additional desk research and included in this chapter are:

- Water
- Energy
- Environment

### Water

An integrated water plan is essential when creating an eco-neighbourhood. For an integral water plan, it is important to identify all natural conditions. On lower-lying clay areas, the water should be drained above surface as much as possible. The water theme works together with several other themes such as the opportunities in combination with energy, environment and urbanism. (Pötz & Bleuzé, 2012)

The use of water in a small country like the Netherlands is always scarce and the demand is always rising. The use of water in life is essential and that is why the EVA-concept tries to get a different view on the use of water in the neighbourhood. Now, in the Netherlands all the used drink water becomes waste water and needs purification. An increase in drink water consequently means an increase in waste water and demand for purification. The case study research revealed a few measures that could be implemented to purify the different bodies of water such as rain water, grey water and black water.

### Green roofs

A green roof may be implemented as a tool to become sustainable. They have plenty advantages such as being attractive, high capacity for rainwater retention, the roof itself heating up less, the underlying construction and spaces, and the surroundings improve while increasing the biodiversity of the area. The most used green roofs are a combination between grass/herbs and moss/sedum roofs. Green roofs can be installed on roofs with slopes ranging from 10° to 35°. At more than 35° extra provisions are required to prevent sliding. (Pötz & Bleuzé, 2012)



*Figure 1 A reference image of a green roof combined with PV panels. (Greenscape, 2017)*

## Fluted gutters

This is a simple way to generate above-water drainage. The water collected in a fluted gutter is drained locally to the surface water or may be infiltrated into the ground. The maximum length of an open gutter is 50 metres and they shouldn't be deeper than 5 cm due to cleaning abilities. The advantage of this form of disconnection is that there is almost no limit in use and that street profiles do not need to deviate. (Pötz & Bleuzé, 2012) There are more options in the form of gutters such as open gutters, prefab fluted gutters and covered gutters.



Figure 2 A reference image of a fluted gutter. (Pötz & Bleuzé, 2012)

## Porous paving materials

Paved areas also bring opportunities by implementing vegetation between the paved material such as grass, gravel or shells. This is for example highly suitable for streets or parking lots. The risk is that the porous areas can't bear too much weight. (Geiger et al., 2009) (Pötz & Bleuzé)



Figure 3 Reference image of porous paving materials as is implemented in EVA-Lanxmeer. (Author, 2017)

## Bioswales (wadi)

A bioswale system is a system for infiltration, buffering and drainage and can be incorporated into the green infrastructure and can help enhance biodiversity. It used approximately 16% of the area and creates a robust water system. A disadvantage of this measure is the high space usage it has. Another measure in the form of a bioswale is the nature-friendly bioswale. This wadi combines plants that are suited to fluctuating water levels as occur naturally in stream valleys along banks. More diverse vegetation not only increases the biodiversity, but also improves the root systems in the ground. (Pötz & Bleuzé)



Figure 4 A reference image of a wadi. (Delft, 2017)

## Rainwater ponds

Rainwater ponds can have multiple purposes but also have a lot of disadvantages. The rainwater ponds might serve as purification area and seasonal storage area by using proper vegetation. The rainwater pond can be combined as playground for children and should be 1.5 metres deep. (Geiger et al., 2009) However, the costs of implementing this measure are high. (Pötz & Bleuzé)



Figure 5 A rainwater pond as it is implemented in EVA-Lanxmeer, Culemborg (Author, 2017)

## Helophyte filters



A helophyte filter is a sand filter normally planted with reeds. The water treatment is done by bacteria living in the roots. The wastewater will seep through the layer of sand and the roots where it undergoes the necessary biological treatment. A drain is placed at the bottom of the sand filter to capture the treated wastewater. Another option is the creation of a horizontal helophyte filter. (Pötz & Bleuzé)



Figure 6 A helophyte filter in winter conditions in EVA-Lanxmeer, Culemborg. (Author, 2017)

Different studies have shown that the collection of rain water is the most important source of becoming self-sufficient. (Martin Rygaard, 2011) Rain water collection offers opportunities to reuse water in toilets and washing machines. In theory, it is possible to become fully self-sufficient when reusing rain water as drink water as well, when purified enough. However, this purified rain water does not fulfil the water quality law and means that it is not officially allowed to use the purified water as drink water. New techniques are going to be developed to purify water in a way it fulfils the demands of the water quality.

## Energy

The depletion of fossil fuels and climate change have led to international, European and national agreements. In recent years, much effort has been given to lowering residential, commercial and industrial energy use through improved insulation and more efficient appliances. In neighbourhoods, very costly for an individual house or building to try to achieve the same energy savings as that of a 'passive house'. A neighbourhood approach to energy production and distribution is more efficient. Energy supply is essential and a broad neighbourhood approach is more efficient than looking at individual housing. However, a separation is made between collective energy use and individual energy use. Collectivism will focus on the combined energy use options within the borders of a neighbourhood and individualism will focus on the measures within a house. (Pötz & Bleuzé, 2012)

## Individualism

One of the innovative ideas created for the energy theme is the Wooneco (Wooneco2) concept and is implemented in the neighbourhood of the 'Olmentuin'. (Appendix ...) WoonEco2 is a model that rises from the initiative of Marsaki and Architecten Alliantie from Goes. The wooneco2 concept offers a sustainable solution for the demand of energy efficient living and working. The concept is based on the passive building concept and following the concept of Trias Energetica. The most important options include:

- The most used and suitable implementation in several projects is the geothermal pump.
- Optimal use of passive solar energy.
- Low-temperature wall heater.
- The winning of heat from ventilation.
- Energy battery within a house.

The main goal of the Wooneco concept, which is most likely to be implemented in this pilot project, is to become climate neutral to NOM. In this concept, the houses have a standard small boiler and have the option to become 'all-electric' by implementing a geothermal pump. Also, PV panels can

be implemented on the roof to get the desired electricity results. The houses don't only compensate the building's legitimate energy use, but also the user's legitimate energy use. The EPC-calculation of a Wooneco house is lower than 0 and fulfilling the demands of the BENG principles.

However, there are major problems when looking at all electric homes, since they provide 0 on the metre on a yearly basis instead of daily basis. They are seasonally sensitive. In figure 2, a 3d model is shown of why and how the problem arises. When the demand to energy is high, the availability of sustainable energy is low. In winter, the energy demand is high and in summer it goes the other way around. This means that the energy system within a building is never in balance. Daily however, opportunities are there to store the energy with a power wall. Figure 1 shows the simple overview of the energy supply over a year.

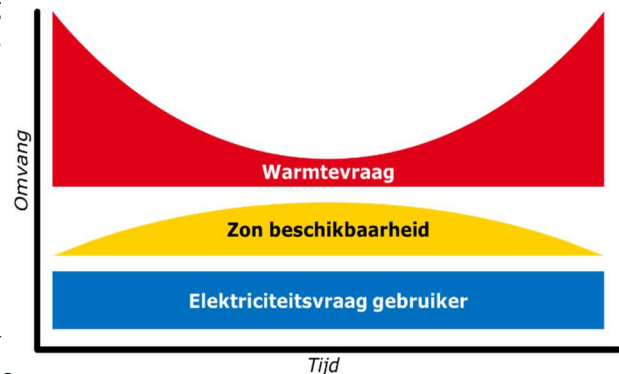


Figure 7 A schematic overview of energy supply in a NOM house.

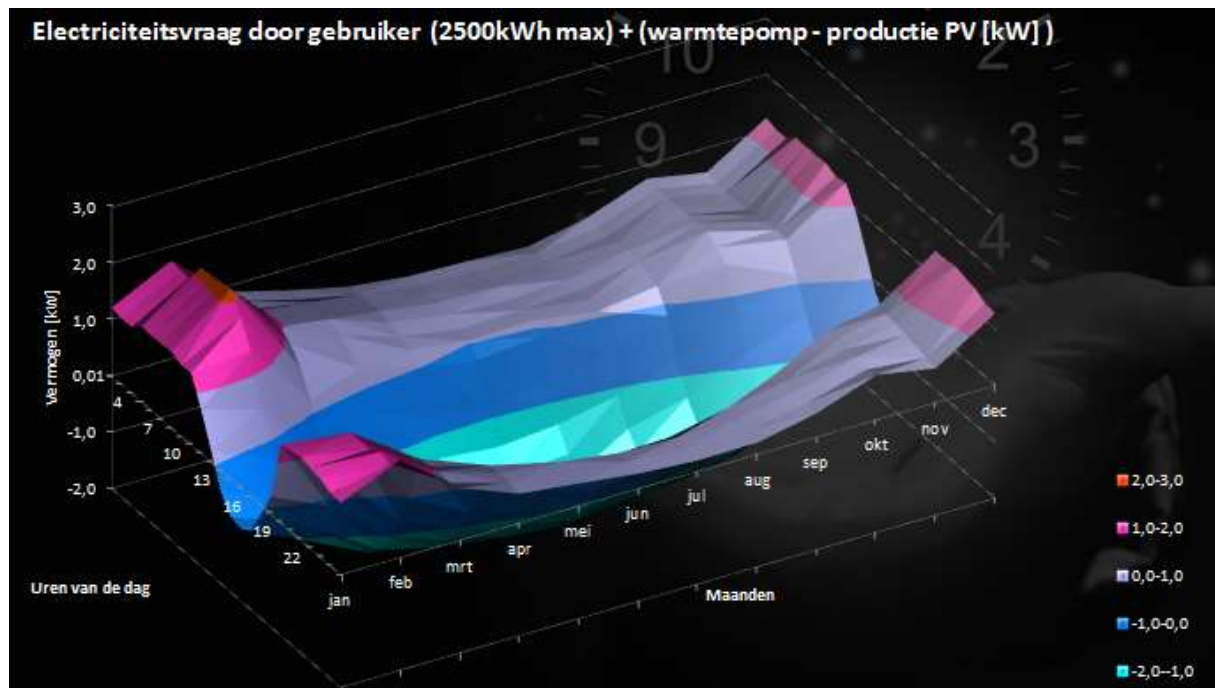


Figure 8 An overview of the energy demand – energy supply over a year. (NOM, 2016)

### Energy storage battery

An opportunity to store the energy that is produced by solar panels has been studied multiple times with the Tesla battery as a result. (Tesla, 2017) This battery is an option to store the solar energy that has been collected but is not necessary at that time. Studies have shown that these batteries are not fulfilling their needs. (Collins, 2017) The main problem with these energy batteries is that they can't store their energy for the number of months necessary to tackle the seasonal energy demand issue. If the energy is stored for that amount of time, it will simply disappear due to the batteries storing options and capacities. This means that on a yearly basis, the power wall can't store their energy and the surplus will come back the main energy grid, which leads in the end to a lack of self-sufficiency.

## Collective

The other way to look at energy use, supply and demand within a neighbourhood is about the collective use of energy. What are the opportunities to store energy within a neighbourhood and distribute the energy among different buildings? By doing this, opportunities rise to distribute energy from houses that don't need it, to houses that have a demand. By applying this technique, where the energy is stored in for example a collective energy battery, the main energy grid can be skipped and the buildings become self-sufficient on the energy level. However, this technique is not yet fully functional and must be further researched for the future. The neighbourhood can include space to create such a network, to be prepared for future innovations and to be prepared for the long-term developments.

## Wind energy

One of the newer possibilities to generate energy within a neighbourhood, is the integration of small-scale wind energy. Some research has been done to the opportunities of wind energy on smaller scale. (Byrne, 2007) However, these researches often occupy broader areas and do not take into account wind energy on building levels. That is why further research should be done to look for opportunities within the urban area of Goes-Oost. When looking at wind energy, it is important to identify average wind speed, energy use and building densities.

## Environment

The term 'environment' is more than just about the natural areas and landscape. A common definition for the environment is: 'The sum total of all surroundings of a living organism, including natural forces and other living things, which provide conditions for development and growth as well as of danger and damage. (businessdictionary, sd) In this research, the environment includes the cohesion of the built environment and its landscape surroundings. (stichting E.V.A., 2012) The integration of the flora & fauna and the respect for the existing landscape is of great importance. The cultural-history of the project area is found by identifying the genius loci. The genius loci define the culture, character and atmosphere that runs through a city and in this case, the neighbourhood. It is important that a genius loci is identified during a research or design process. To get the best perspective of how the environment can combine several principles, the concept of permaculture is used.

## Permaculture

To integrate nature and the built environment the concept of permaculture is used. The concept of permaculture has been defined a long time ago by several professionals, the first ones being Hopkings (1910) and King (1911). The concept of permaculture, deriving from 'permanent' and 'agriculture', has developed over the past century and a common definition is described:

*'an integrated, evolving design system of perennial or self-perpetuating plant and animal species useful to (hu)man(s). Also, it is perceived as the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems.'* (Mollison, 1988)

Permaculture has been further analysed in the study of Jungho Suh (2014) where the most important principles are described. It is a system for designing and creating human habitats that are in line with nature's patterns and it uses natural resources sustainably. There are four main principles:

5. Caring for the earth;
6. Caring for people;
7. Setting limits on population and consumption;
8. And redistributing surplus. (Suh, 2014)

To create a sustainable neighbourhood, case studies and literature studies have shown that permaculture should be involved and it is called urban agriculture when it is applied in urban areas. (Viljoen et al., 2012) (Pötz & Bleuzé, 2012)

Furthermore, permaculture can be split up in several zones, to make it more accessible for integration. Six interacting zones have been defined and can be seen in figure 9.

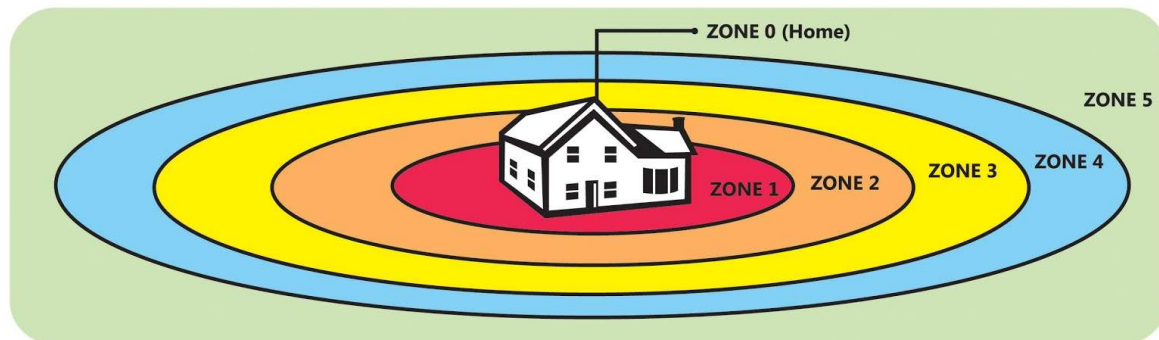


Figure 9 The six zones of permaculture. (Padmin, 2016)

The six zones of permaculture within a neighbourhood were defined in several studies (Padmin, 2016) (Mollisson 1988) This research however uses the first five zones since the sixth zone encompasses the wild uncultivated natural areas, which are not existing in the project area.

### Zone 0

The home of the inhabitant is the first zone and has as main goal the sustainable use of the water and energy use of the house. This zone should reduce the impact on the environment as much as possible.

### Zone 1

Zone 1 is in close cooperation with zone 0 and stands for the close environment connected to the residential area. This can be for example a private garden or a small natural close to an apartment. Connections within the first two zones include for example the cooperation between water collection.

### Zone 2

This zone is considered as a soft edge between highly cultivated, high input design elements and more wild, hardy, and resilient systems. This translates well to tended patches of perennial production in the landscape such as a forest garden. This zone forms the highly maintained cultivated area in a neighbourhood called 'urban agriculture'. (Pötz & Bleuzé, 2012)

### Zone 3

This zone is the main natural area of a neighbourhood that needs less maintenance and uses bigger corps. Think of fruit trees located throughout the neighbourhood. This zone from a combination with zone 4.

### Urban agriculture

Previously mentioned in the zone principles of permaculture is the concept of urban agriculture. This definition is part of zone 2 and includes the production of food in an urban area as is described in the book of Urban Green-Blue Grids (Pötz & Bleuzé, 2012). Urban agriculture has various diversities in application but has common advantages. Implementing urban agriculture



in the form of small-scale food production maintains and increases the biodiversity of an area. It also applies no pesticides in organic businesses and has therefore more 'weeds' and more biodiversity. Urban agriculture also closely cooperates with rainwater buffering. The buffered rainwater can be reused for irrigation of the small-scale agricultural farmland and this results in decentralised cycles, one of the goals of self-sufficiency. (Lohrberg, 2001) (WUR, 2006)

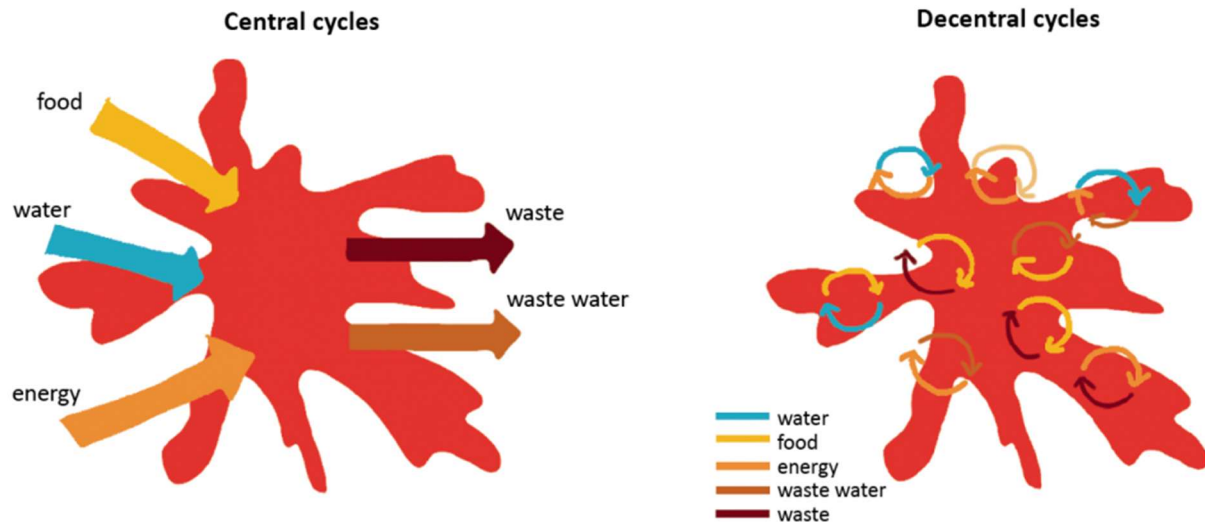


Figure 10 Central cycles and decentral cycles. (Lohrberg, 2001)

The planted surfaces in a densely populated urban area also contribute to the reduction of heat stress and increase the air quality. This together results in the increase of the overall quality of life in a neighbourhood. Urban agriculture brings back a certain amount of autonomy within a city and is therefore a solid addition to a new neighbourhood. (Pötz & Bleuzé, 2012)

## Appendix 6 ‘Design process’

The last part of the research is about showcasing the previous research in the form of a pilot project, which is also the main research’s main goal as has been described in the methods chapter. All the acquired data and results from the previously explained methods are applied to the Verzetsheldenbuurt, which has been analysed in the theoretical framework. Jean Noel Kapferer defined a design in 2004 as ‘a continuous process that gives value to a product, with the result to give it a better use, making it cheaper and making it more beautiful.’ This is also called ‘design thinking’. A design thinking process can be seen in the figure below.

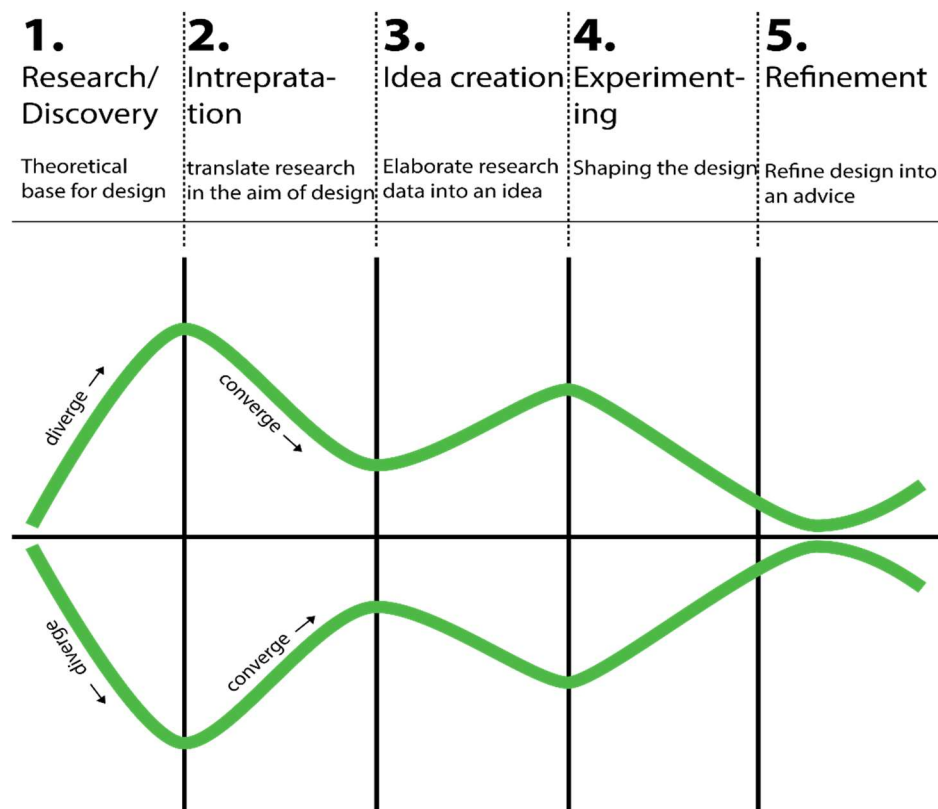


Figure 1 Design thinking process

First, it is important to do proper research and identifying the needs of an organization. Extensive knowledge, understanding and empathy are central in this phase, as well as finding background information. Then it is important to do field observations and implement the research into the aim of a design. The third step is to create ideas and putting them into a general vision for an area. Then it is time to experiment the different options and model the outcomes by monitoring and evaluating. This can also be done by looking at the different case studies and their outcomes. Lastly, a design can be created that includes all the previous research. In this chapter, the design process for the Verzetsheldenbuurt is elaborated according to the design thinking theory. (Figure 1)

## 1. Research/discovery

During the research and discovery phase in the design process, an eco-neighbourhood catalogue has been created based on the most important defined themes: water, energy, urbanism, environment, participation, finance and process. This eco-neighbourhood catalogue forms the first paragraph of the results chapter and concludes the research phase. (Chapter 4.1)

Another part of the research and discovery phase is the area analysis and includes several conclusions that are of relevance to the design and will form the theoretical base, (Chapter 2.5)

## 2. Interpretation

The second phase of the design process is about translating the research into the aim of the design. This is done by identifying the most important opportunities of the project area together with the eco-neighbourhood catalogue and resulted into the main vision of the project area. (Chapter 4.2) By making this vision, some of the options for the catalogue already fall short and are excluded from the design part. This means the converging line of design thinking has started and will lead to the idea creation paragraph.

## 3. Idea creation



Figure 2 Sketch 1 (Author, 2017)

When creating an idea for a design that derives from the vision, the relevance of looking as broad as possible at first is important. That is why the initial phase of the design process included a 'shape study' (figure 2), where the most important flows in the area were defined, also partly derived from the area analysis. The shape study shows the flow from urban to agricultural land and shows the urge to make a connection between these in the project area. Also, the surrounding water could make an appearance in the new neighbourhood.

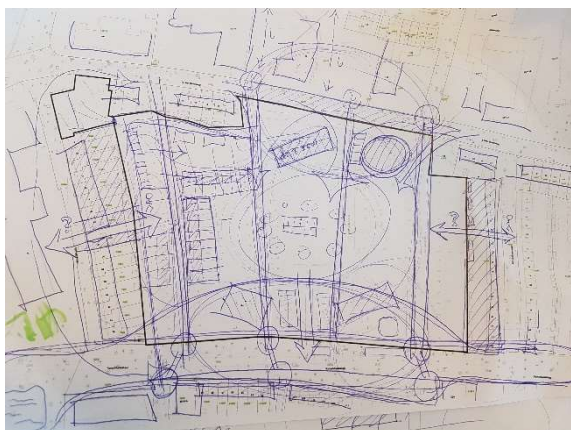


Figure 3 Sketch 2 (Author, 2017)

Then, a second shape study (figure 3) was done together with Marnix van Driel and this revealed the flows at the borders of the project area. The northern border shows the importance of big buildings and the southern border shows the importance of greenery, since it is the only street that includes public green. Opportunities arise to build apartments at the northern border since this will connect the bigger northern buildings with the neighbourhood. Also, the northern street has the most traffic noise.

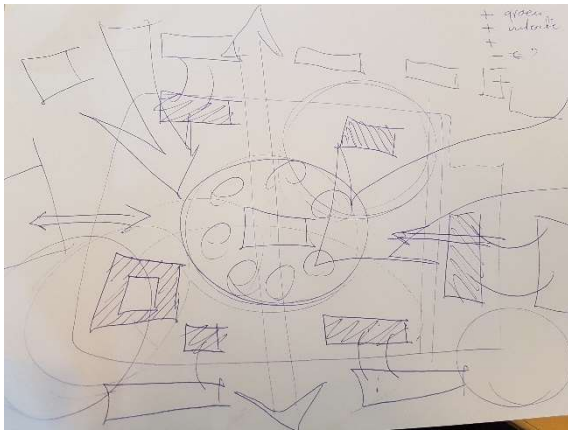


Figure 4 Sketch 3 (Author, 2017)

Then, the process continued by looking at opportunities to create entrances in the neighbourhood. (figure 4) Where are the gaps? Where will you be drawn in the neighbourhood? This sketch concludes that the western part can become an opening. Also, the northern and the southern part of the neighbourhood should breathe enough and will get openings, while also keeping the closed environment of a community. The importance of creating a communal garden is still always coming back in the sketches.

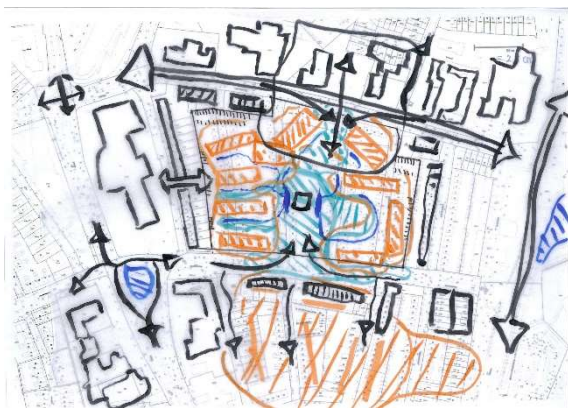


Figure 5 Sketch 4 (Author, 2017)

Further sketching (figure 5) started to result in some more specific shape studies where the building structures, road networks, and water opportunities were combined. Another result from this sketch was the fact that the area south of the project area is a residential area and might be of influence in the long-term future. The southern part is more connected than the northern part. Also, the positioning of the buildings was included in this sketch. There are various opportunities to position the buildings. When shaping scenarios, the existing infrastructure is also of great importance.

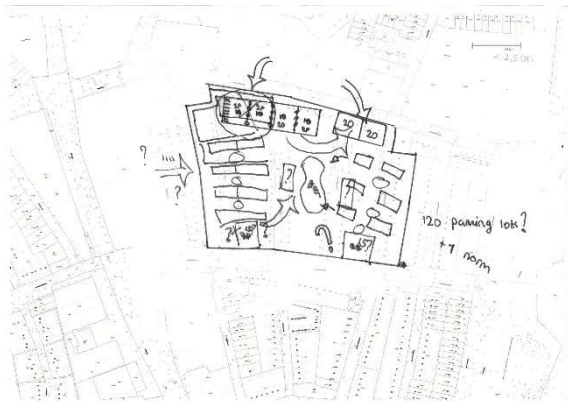


Figure 6 Sketch 5 (Author, 2017)

An interview with Pierre Bleuzé ([Appendix ...](#)) revealed the importance of looking at parking lots first since this requires a lot of space of the project area. That is why a sketch (figure 6) shows various options of incorporating the parking lots in the neighbourhood, especially on the borders. Parking lots however, diminish the quality of sight and that is why they have to be kept out of sight as much as possible. However, parking lots won't affect the northern buildings since it is not a residential area. Parking lots have an average size of 5m x 2,5m. (Marsaki, 2017)





Figure 7 (Author, 2017)

This sketch (figure 7) shows the no-building zone for a scenario to create a financially feasible design, where the infrastructure remains mostly where it is. The question rises however, where to put the roads now when not building on the yellow layer.



Figure 8 (Author, 2017)

Several scenarios have to be included to get to the best solutions and that is why multiple building orientations have been done. (Figure 8) Considerations were done of how important the orientation to the south is and if it weights up to the other advantages or disadvantages. Figure 7 shows a big U going around a communal area. This green space will probably will be too big to maintain for the inhabitants, and that is why another solution must be analysed.

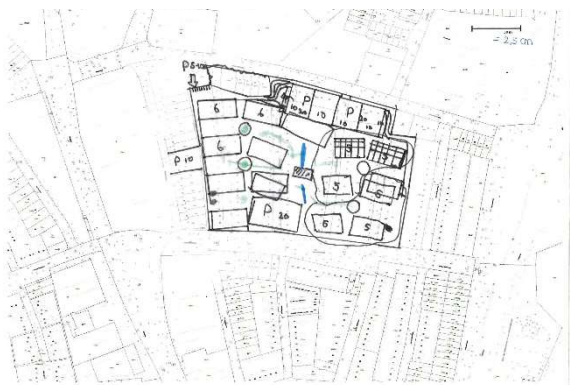


Figure 9 Sketch 8 (Author, 2017)

Figure 5, figure 6 and figure 8 together from the basis for the sketch in figure 9. Parking lots, smaller communal green areas and infrastructure were identified for this scenario. Building blocks were also measured to stay within scale proportion. The neighbourhood will mostly exist of life-cycle and small one family houses. And small apartments. (Cataloguswoningen RWS, 2015)

Type	Levensloop Type 1	Levensloop Type 2	Eengezinswoning Klein Type 1	Eengezinswoning Klein type 2
Breedte(beuk) (m1)	6,5	6,5	3,9	4,15
Lengte (m1)	12	11	10,7	10

Figure 10 Catalogue of houses (RWS, 2015)

## 4. Experimenting

A first detailed sketch (figure 11) came forward from all previous sketches, where buildings were already measured in the spatial concept and idea creation transforms to experimenting. The problem in this scenario is the lack of air in the neighbourhood, which is also a problem in the current case. However, when broadening the buildings, giving more space, smaller communal green areas arise, all connected to a big communal garden. Also, problems with parking lots are occurring in this sketch.



Figure 12 Sketch 10 (Author, 2017)

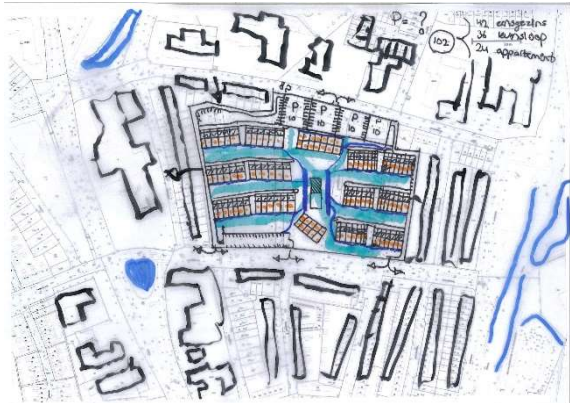


Figure 14 Sketch 12 (Author, 2017)

Figure 12 shows one of the most important sketches, where the existing infrastructure is kept in place and a way around was going to be the main goal. This revealed that not all roads were necessary anymore. The point of leaving the infrastructure is to remain the underlying drainage and water system as it is, but only changing some of the roads above the surface. This will reduce the cost immensely and that is why such a scenario is going to be developed.

This scenario (figure 13) was one of the main ideas and a direct translation from the broad vision. However, concluding from this sketch, it won't be a suitable scenario due to various factors. Infrastructure needs change, there is a lack of housing possibilities, the communal green area will become too big and decreases the social cohesion and the neighbourhood will get a bad appearance to the rest of the neighbourhood. This scenario will therefore not be changed into an advice.

Figure 14 shows the ideal scenario, which will become a spatial concept. As can be seen, the infrastructure is changed completely since this won't be included in the scenario. Parking lots are included at the northern border mainly, since this doesn't decrease quality of the surrounding area. This neighbourhood will generate six communal green areas, connected to a main grid. It is easy to connect the water to the wadis since the neighbourhood has straight lines.

## 5. Refinement

The last part of this process includes the refinement of the spatial concepts in the cooperating software and generating an advice. The previously made scenarios are tested and finalized by looking at the themes: water, energy, urbanism, environment, participation, finance and process.

- *Water system:* The water system should flow as a key factor through the neighbourhood and should get enough space making an urban design.
- *Energy system:* The energy system should be self-sufficient where possible. The criterium focuses on the orientation of the houses towards the sun.
- *Housing density:* A key criterium is the restructuring process, by bringing back enough houses.
- *Phasing opportunities:* By creating blocks relevant to the phasing process, the restructuring process can easily be justified.
- *Level of community:* Creating one big communal green area or making small areas?
- *Environmental quality*
- *Infrastructure:* The existing can be changed in a certain scenario, but is this also suitable?
- *Finance:* An urban plan should of course stay as realistic as possible, by staying within financial borders.

## Appendix 6.1 Design Interview – Pierre Bleuzé

3-5-2017

Tijdens dit interview is gebruik gemaakt van het coderen van de tekst met de volgende labels per onderwerp (zie conceptual framework): participation, urbanism & environment, water, energy, finance en process.

A second interview or so called meeting has been done with Pierre Bleuzé, where the start of the design process has been discussed and some issues within the different themes were highlighted. A summary of this interview is written to highlight the most important findings of this meeting.

The first design sketches were shown and some issues rose about the water runoff to the centre of the neighbourhood. The importance of collecting rain water is high and this should be executed carefully. The houses however, were oriented good to the south. He also said that implementing a vertical helophyte filter will take a lot of extra finance and installation. This will need more space than available in the project area now. By implementing a helophyte filter, the neighbourhood's water system will become very complex.

The long-term vision for energy use should include car electricity as a future battery storage source. In the future, all houses will have an electric car and the importance of including them in the long-term energy vision is important, instead of using existing power grids.

Participation was again being highlighted in this interview. A key fact that has been found in both the neighbourhoods of Hof van Heden and EVA-Lanxmeer is that a communal garden works best when it is executed with small groups. One big communal garden is very complex to work since the cooperation becomes harder due to differences in opinion and a decreased sense of place. That is why options should be opened to generate a neighbourhood that has smaller communal gardens, to be maintained by the inhabitants, all connected to a large garden, where the kitchen garden has been implemented. This will come back in the spatial concept.

### Design

*Parking:* During the design period, the position of the parking lots is one of the most important aspects and probably the one that you should start with. It is important to make parking lots on both sides, so it won't be unfair for inhabitants who are located further from the parking lots. Parking lots take up a lot of space and this will be a leading factor in the neighbourhood. Parking spaces can be combined with greenery.

*Phasing:* During the restructuring process, the neighbourhood is going through different types of phasing. The importance of including these phases can be of relevance to RWS, who is responsible for the financing. By using this concept, the smaller communal areas can also be justified, by making more blocks.

*Traffic noise:* Another aspect that should be considered more, is the traffic noise coming from the adjacent streets. How can this be decreased as much as possible? Can buildings have an influence on this?

A business plan inhabitants and RWS should be created to show the opportunities an eco-neighbourhood has. This must stay very rough though, since it is not possible to calculate this neighbourhood in exact detail since it remains a dynamic plan that needs involvement from the inhabitants.



The urban plan scenarios should be based on several criterium. These criteria have been defined together with Bleuzé.

- *Water system:* The water system should flow as a key factor through the neighbourhood and should get enough space making an urban design.
- *Energy system:* The energy system should be self-sufficient where possible. The criterium focuses on the orientation of the houses towards the sun.
- *Housing density:* A key criterium is the restructuring process, by bringing back enough houses.
- *Phasing opportunities:* By creating blocks relevant to the phasing process, the restructuring process can easily be justified.
- *Level of community:* Creating one big communal green area or making small areas?
- *Environmental quality*
- *Infrastructure:* The existing can be changed in a certain scenario, but is this also suitable?
- *Finance:* An urban plan should of course stay as realistic as possible, by staying within financial borders.

## Appendix 6.2 Design Interview – Perry Zijlema

11-5-2017

The purpose of this interview was to get feedback on the spatial concept scenarios that have been developed. These scenarios have been forwarded to Perry Zijlema, an urbanist at the municipality of Goes. By getting help from Perry Zijlema, the research becomes more reliable and the scenarios are easier to justify.

### Case studies

First, the interview started with the discussion of the case studies that have been used. Mr. Zijlema explained the importance of using many case studies. By using a lot of case studies, the scenarios become more reliable and the decisions taken are easier to justify. Some case studies forwarded by Mr. Zijlema have been included in the thesis:

- Ruwenbos, Enschede: a project where wadi's flow through the neighbourhood and are dry 85% of the year. (Pötz & Bleuzé, 2012)
- Westhausen, Frankfurt: An early project, which was a pillar in building sustainably and as planned as possible. The concept has been widely used and comes back in the first scenario. (Westhausen, 2016)
- Begijnhof, Breda: Another project that involves a communal garden with optimal social cohesion. (Breda, 2014)

### Scenarios

So far, the thesis consisted of two spatial concept scenarios and have a connection with the previously mentioned case studies. However, adding a third concept that combines the ideal scenario with the most realistic scenario makes the research more complete and creates added value to the justification. Three scenarios will be realised:

1. Ideal scenario
2. Realistic scenario
3. Combination of ideal and realistic scenario

The interview served as a confirmation of the design process.

### Connection case studies with scenarios

The importance of connection the scenarios to the applied case studies is high. For example, scenario 2 uses a Begijnhof. Scenario 1 uses the old neighbourhood of Westhausen in Frankfurt.

## Appendix 7 'Financial strategy'

When developing an eco-neighbourhood for the social class, the importance of financial feasibility is high. An eco-This neighbourhood inevitably generates extra investments that need solving. To roughly determine the additional costs and benefits of the Verzetsheldenbuurt and to determine its financial feasibility, a cost-benefit analysis and strategy has been developed. This paragraph consists of three parts: Determining relevant subsidies in creating an eco-neighbourhood, determining the additional investments for building an eco-neighbourhood against building a neighbourhood according the normal procedure. The second part consists of the benefits of developing a foundation (Verzetsheldenbuurt BewonersVereniging) and determining the added value and return on investment it could have for both the renter and the owner. The calculated numbers will stay rough since the goal is not about identifying exact numbers. This analysis is more about identifying the opportunities an eco-neighbourhood could have on the financial strategy specifically for the Verzetsheldenbuurt. The financial strategy has been based on the case study research and the internal databases of Marsaki. (Appendix 1) (Marsaki, 2017)

### Subsidies and taxes

Living sustainably and building sustainably offers several subsidy possibilities in the Netherlands. Think of subsidies on solar panels, wind energy or rainwater catchment. Some of these subsidies are taken care of on a national level. A lot of subsidies are dealt with locally, and are handled per municipality.

<b>Subsidies building sustainably (RVO, 2017)</b>	
Financing Greenproject	This subsidy is a tax rebate that is used by banks to finance their sustainable measures at a lower interest rate. Owners of houses might be able to use this subsidy to apply measures in their houses.
Sustainable energy production (SDE) (ISDE)	This subsidy is stimulating people to use sustainable energy and is called the SDE. (Stimulerend Duurzame Energieproductie)
BTW 19% > 6%	The BTW rate in the Netherlands to execute isolation measures has been lowered from 19% to 6%.
Subsidy energy label	The Netherlands uses several energy labels varying from A to F. It is possible to get a subsidy when a jump is made from one label class to another.
Municipal subsidies	Several municipal subsidies are possible in the Netherlands: Limburgse energy subsidy, Rotterdam green roofs.
Subsidy heat pump (RVO, 2017)	By applying a heat pump in a new house or adding one to an existing house, it is possible to get a subsidy from one of the previously mentioned energy saving subsidies.
Stimuleringsregeling energieprestatie huursector (STEP)	A subsidy that make it easier to invest in sustainable housing for housing corporations. An average of €5000 euros can be acquired per house for the corporation.

Subsidies are also divided on a local scale in for example, municipalities. These subsidies are always changing on a yearly basis and means that continuous research must be done to analyse the possible subsidies for an eco-neighbourhood. (RVO, 2017) Being dependant on subsidies during the whole process is not suitable, but it helps when starting a project.

Furthermore, there are both advantages and disadvantages on disconnecting from the energy and water network and using sustainable techniques. The ODE (opslag duurzame energie) is a tax applied to the usage of sustainable energy. The generated tax of this measure is meant for the SDE subsidy pot. The main advantage of becoming self-sufficient in a neighbourhood is the significant reduction of energy and water use from the main grid and therefore a reduction in the bill. In the neighbourhood of Goes-Oost, some of the subsidies are a possibility such as the SDE and the subsidy energy label. However, identifying a financial strategy that does not build on subsidies or taxes is more interesting and provides more opportunities for further use.

## Additional investments

Building a neighbourhood involves several normal costs that won't be affected when building it. Normal superstructure costs and land use costs form the basis of the cost-benefit analysis. The average extra costs when making a house NOM (Nul op de meter) is €23000 and this will be covered by the added EPV. (energieprestatie vergoeding) (Appendix 6.1)

On a neighbourhood scale, a general cost-benefit analysis shows the normal costs and procedures done. Also, the additional potential costs when building a sustainable neighbourhood are shown. These are the costs normally excluded when building a non-eco-neighbourhood. These costs include a wadi, greenhouse, above-water drainage system (often cheaper than a normal drainage system), public greenery, kitchen garden. All the costs have been based on internal data by Marsaki. If an external source is used, it says so. (Marsaki, 2017) The main result of this table are the additional costs to build an eco-neighbourhood. These costs were then divided by the number of houses present in the eco-neighbourhood. (100) This results in the average additional investments needed per house. To tackle this issue, opportunities rise. Appendix 6.2 shows a financial analysis of the average additional costs that must be included to balance the additional investments of the eco-neighbourhood. It shows that an addition of €27,00 per month per house is needed to balance the additional investments. The additional investment will then be recovered in 25 years. Another opportunity to balance the extra investments are to research and sign up for more subsidies. These additional benefits could possibly decrease the buildings costs in the starting phase. (Marsaki, 2017)

## Foundation (VBV)

The foundation of the Verzetsheldenbuurt forms the main financial body through the neighbourhood and this is what the inhabitants will deal with the most. The foundation will generate several benefits, mostly coming from the contribution of the inhabitants. The benefits are split up in collective and individual benefits. Collective benefits are the ones achieved by using materials, taking off insurances, producing collectively, all together instead of doing it individual. This will be possible due to the high social cohesion the eco-neighbourhood generates. By doing these things collectively, it will spare money and will produce benefits for the foundation. (appendix 6.3)

The second flow of benefits for the foundation is the individual contribution the inhabitants make. Inhabitants benefit from living in the neighbourhood and to maintain this added value, they will have to pay a certain amount of money to balance the foundation's costs. The main benefit the inhabitants have is the disconnection from the main energy and water grid. Also, subsidies on individual buildings are added to their benefits. These benefits have costs on the other side. The costs for the inhabitants will be a higher rent than usual, since building an eco-neighbourhood



adds additional costs and new houses have higher rents. (Marsaki, 2017) The benefits from the disconnection of the grid can partly be reinvested in the contribution to the foundation. This will generate a certain amount for the foundation to invest in the quality of the area and its level of sustainability. These costs for the foundation are new investments in sustainability for the neighbourhood. The long-term vision can then be accomplished. Also, investments in education can raise awareness. This financial strategy adds value to the RWS Partner in Wonen since inhabitants can pay rent easier since they are disconnected from the grid. This strategy is only an option and does not provide specific numbers and figures. Further research to the specific measures that could help the Verzetsheldenbuurt is necessary to determine its official financial feasibility.

A financial strategy does not only include numbers of money. When creating an eco-neighbourhood social benefits are of high importance. The activities included in an eco-neighbourhood have a favourable effect on the people and place and not all benefits can be quantified by numbers. For example, in the Verzetsheldenbuurt, quality of life will be higher than a normal neighbourhood and a high social value occurs. These unidentifiable benefits are included as social benefits.

## Conclusion

To conclude this chapter, an overview will be created that shows the financial feasibility of an inhabitant who is going to live in the Verzetsheldenbuurt. First, a framework has been created that shows the most important inflows and outflows, including the social benefits.

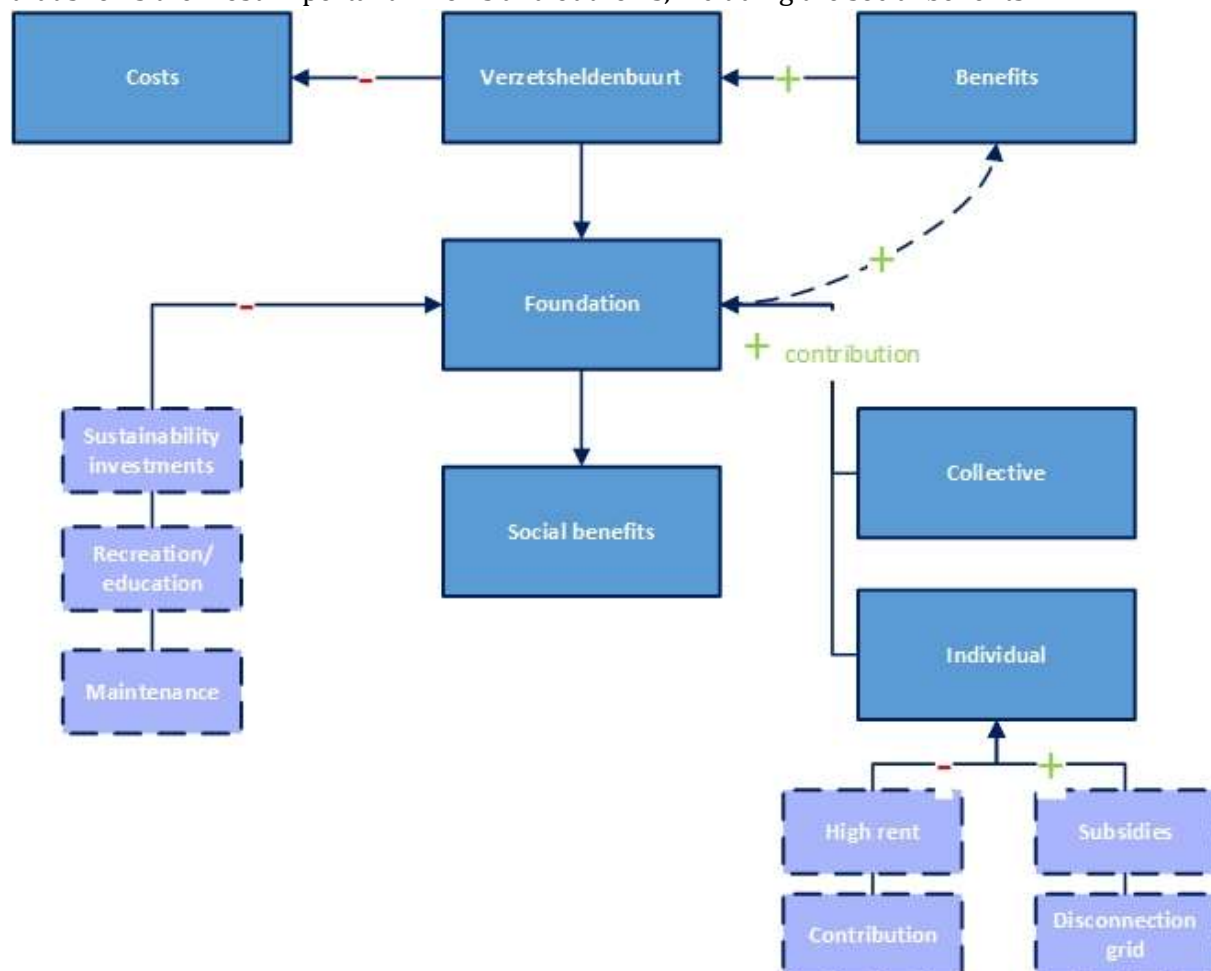


Figure 1

One house in the Verzetsheldenbuurt will generate an additional cost of €5388, - in the building process. To earn this money back within 25 years, an extra rent of €27, - is needed for the inhabitants to pay per house per month. To cover for the costs of making a house NOM, an additional €115, - per month is needed as EPV value. Furthermore, the inhabitant will have to pay €10, - per month to pay for the contribution of the foundation. These go together with the additional benefits the eco-neighbourhood generates.

A financial analysis has shown an eco-neighbourhood not to be a 'financial nightmare' and they are financial feasible. It can be questioned if the neighbourhood will still be suitable when a higher level of self-sufficiency is reached. The foundation serves to cover the maintenance of the neighbourhood without causing too many additional costs. This decreases the overall pressure on the overall costs.

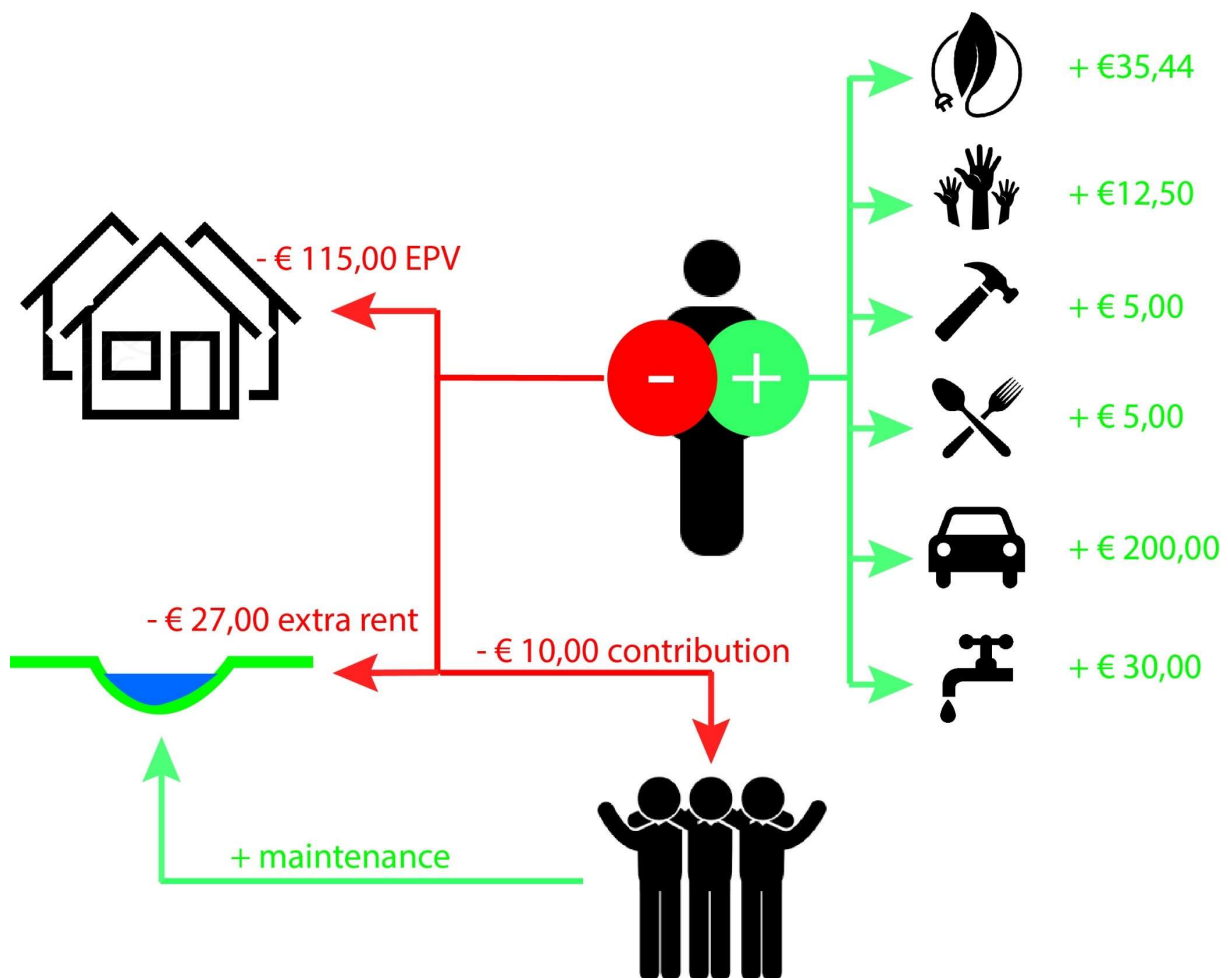


Figure 2

## Appendix 7.1 'Cost-benefit analysis additional investments'

Verzetsheldenbuurt				
Standaard kosten	Levensloop type	Eengezinswoning type 1	Appartement klein	
Stichtingskosten per eenheid (grondkosten + bouwkosten)	€ 162.796	€ 128.930	€ 147.397	
Extra NOM kosten (avg. 23000)	€ 23.000	€ 23.000	€ 23.000	
Aantal woningen	40	40	20	
Totaal (Marsaki, 2017)	€ 7.431.840	€ 6.077.200	€ 3.407.940	
Standaard publiek groen (30% = 13000 m2 €60)			Totaal (Marsaki, 2017)	€ 16.916.980
Meerkosten	€ p. m2	aantal m2	aantal	
Wadi (x2) (€5,17 p. m2 x 280 m2 x2) (Pötz & Bleuzé, 2012)	€ 5	280	2	€ 2.934
Ingerichte kas (€250 p. m2 x 400 m2) (GWW, 2017)	€ 250	400		€ 120.000
Publiek groen (fruitbomen + natuur) (18000 - 13000 m2 x €60) inclusief bome	€ 60	5000		€ 300.000
Moestuin (1000 m2) (€80 p. m2 x 200m2) (geen waterkosten)	€ 8	1000		€ 8.000
Loopbruggen (€5000 x 4) (GWW, 2017)	€ 5.000		4	€ 20.000
Waterspeeltuin (€257 p. m2 x 100 m2) (GWW, 2017)	€ 257	100		€ 30.000
Materiaalhok (60 m2) (GWW, 2017)	€ 166	60		€ 10.000
Opkopen huis (Goes-Oost, 2017)	€ 160.000		1	€ 160.000
Hemelwaterafvoer bovengronds ipv grijswaterriool	€ -12.000			€ -12.000
Groene daken (€ 75 p. x 30 m2 x 2)	€ 75	30	2	€ 4.500
Onvoorziene kosten (15%)				€ 95.375
			Totaal meerkosten	€ 738.809
				/100
			Meerkosten per woning	€ 7.388
Baten	Levensloop type	Eengezinswoning type 1	Appartement klein	
Huurprijs (kostendekkend) (p. maand)	€ 671,00	€ 583,00	€ 641,00	
EPV (€ 1,00 p m2) (p. maand) (NOM-kostendekkend)	€ 138,00	€ 108,00	€ 103,50	
Subsidies (€2000 per huis) (SDE + ISDE)	€ 200.000,00			
			Balans	€ 538.809
				/100
			Totaal meerkosten per woning	€ 5.388

## Appendix 7.2 'Calculation average rent addition'

Snelle berekening van een investering / cq woningaanpassing						huurinkomsten			
Gegevens			NCW berekening van huurstijging			extra huur p.j.    nominaal cum.    ncw cumulatief			
Investering	5.388,00	ex btw	stijging	2,00%	jaar	1	324,00	324,00	307,84
BTW	0%		disconto	5,25%	jaar	2	330,48	654,48	606,17
	3.120,53	btw				3	337,09	991,57	895,29
	8.508,53	incl. btw				4	343,83	1.335,40	1.175,48
			NHW	€ 5.418,16		5	350,71	1.686,11	1.447,03
			NHW	€ 5.418,16		6	357,72	2.043,83	1.710,18
Termijnen	25	jaar				7	364,88	2.408,71	1.965,21
Rente	5,25%					8	372,17	2.780,88	2.212,37
annuïteit	€ 0,00	per jaar				9	379,62	3.160,50	2.451,89
Verzekering elders opgenomen						10	387,21	3.547,71	2.684,02
						11	394,95	3.942,66	2.908,98
						12	402,85	4.345,52	3.126,99
						13	410,91	4.756,43	3.338,27
						14	419,13	5.175,56	3.543,03
						15	427,51	5.603,07	3.741,46
						16	436,06	6.039,13	3.933,77
						17	444,78	6.483,91	4.120,13
						18	453,68	6.937,59	4.300,75
Totaal	€ 0,00	per jaar				19	462,75	7.400,34	4.475,78
						20	472,01	7.872,35	4.645,42
						21	481,45	8.353,79	4.809,81
Totaal	€ 0,00	per maand				22	491,08	8.844,87	4.969,13
in huur p. mnc	€ 27,00					23	500,90	9.345,77	5.123,52
						24	510,92	9.856,68	5.273,15
verschil	€ 27,00					25	521,13	10.377,82	5.418,16



## Appendix 7.3 Foundation VBV

### Bewoner Verzetsheldenbuurt (per maand)

	Per maand
Maandelijkse energiekosten NOM	€ -9,60
Maandelijkse EPV (avg.)	€ -115,00
Huurprijs (avg.)	€ -620,00
Vereniging contributie	€ -10,00
	<b>€ -754,60</b>

### Besparing bewoner Verzetsheldenbuurt

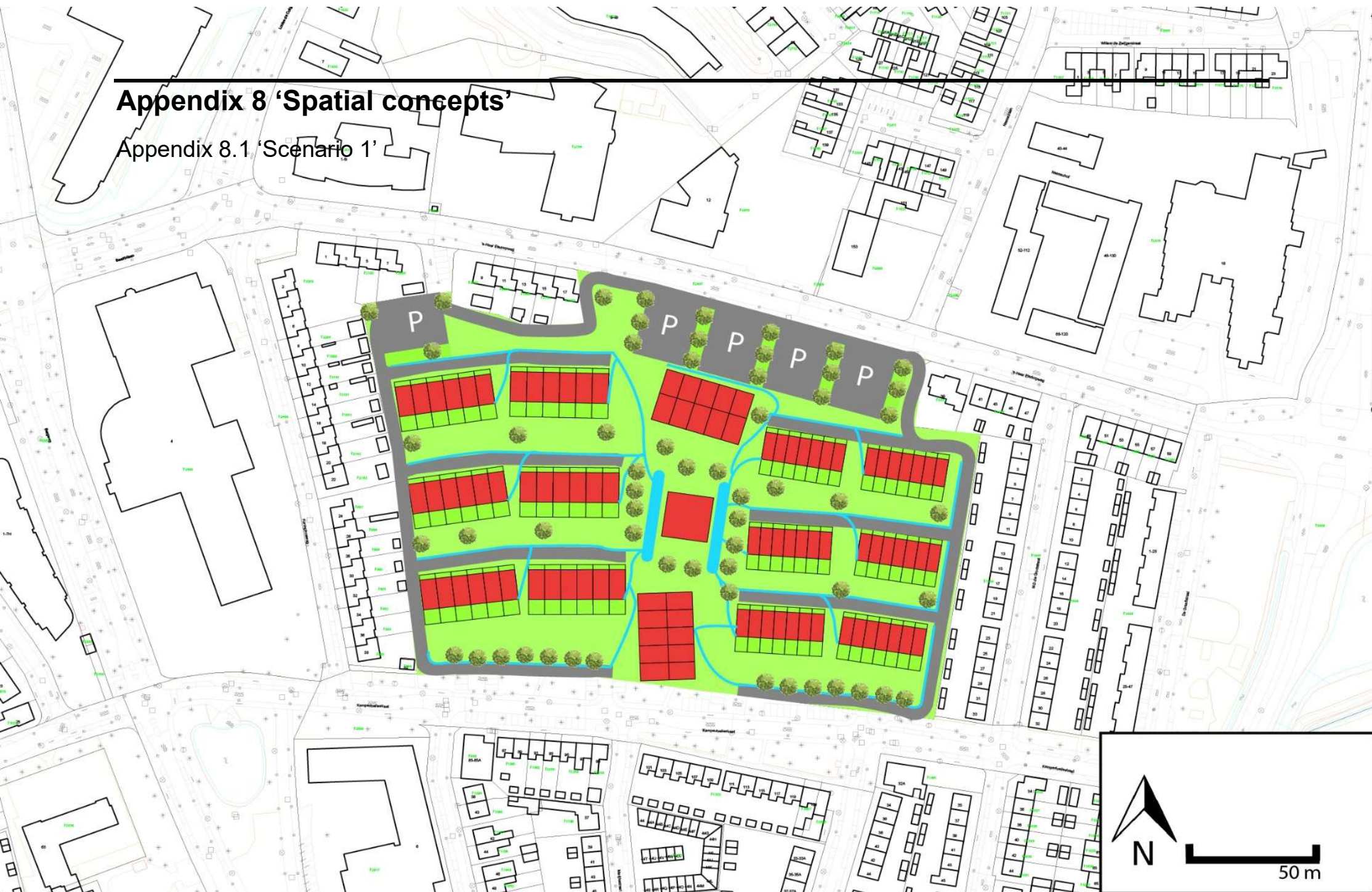
	Per maand
Maandelijkse energiekosten	€ 35,00
Collectieve verzekering (150 eu p jaar) (ABN AMRO)	€ 12,50
Collectief materiaalgebruik	€ 5,00
besparing eten	€ 5,00
Gedeelde auto's (Kennis platform VV, 2012)	€ 200,00
Maandelijkse waterkosten (30% besparing)	€ 30,00
	<b>€ 287,50</b>

Verenigingskosten	per maand	per jaar
Onderhoud publiek groen	€ 80,00	
Gereedschap	€ 10,00	
Evenementen	€ 50,00	
Verzekeringen	€ 500,00	
Onderhoud gebouwen	€ 50,00	
Overige kosten	€ 100,00	
Administratie	€ 200,00	
Onderhoud kas	€ 50,00	
	<b>€ 1.040,00</b>	<b>€ 12.480,00</b>

Opbrengst Vereniging	per maand	per jaar
Contributie	€ 1.000,00	
Subsidies	€ 100,00	
RWS investering	€ 100,00	
	<b>€ 1.200,00</b>	<b>€ 14.400,00</b>

## Appendix 8 'Spatial concepts'

### Appendix 8.1 'Scenario 1'





## Appendix 8.2 'Scenario 2'





## Appendix 8.3 'Scenario 3'

